PROFESSIONAL
TWO-WAY RADIO

PT5200

FM PORTABLE RADIO
SERVICE MANUAL

V070607

KIRISUN ELECTRONICS (SHENZHEN) CO., LTD

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DANGEROUS!!

Do not connect the AC power or DC power over 8.6V with any connector or terminals of the radio. Otherwise it will cause fire, electric shock or damage to the radio.

WARNING

Do not reverse power connection.

It may cause harm to the radio if signal input on the antenna connector is bigger than 20 dBm (100mW).

Do not turn on the power before the antenna or load connection is completed.

If the antenna has been damaged, do not use the radio. Damaged antenna may cause lightly burning on skin.

Though the radio is waterproof, it's better to avoid putting it in rain or snow, or any other liquid to ensure its life and performance.

STATEMENT

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CONTENTS

Chapter 1 Introduction.....2
Chapter 2 Radio Overview and Function Keys.....2
Chapter 3 Electrocircuit.....3
Chapter 4 Function Description and Parameter Setting.....8
Chapter 5 Service Assemble and Disassemble.....10
Chapter 6 Radio Debugging.....13
Chapter 7 Technical Specifications.....15
Chapter 8 Trouble Shooting.....15
Chapter 9 KBC-42A Charger.....16

Appendix 1 Abbreviations.....16
Appendix 2 Electronic Component List.....16
Appendix 3 Framework Component List.....17
Appendix 4 Accessory List.....21

Figure1 PT5200 Top Board Position Mark Diagram.....22
Figure2 PT5200 Bottom Board Position Mark Diagram.....23
Figure 3 PT5200 Schematic Circuit Pane Diagram.....24
Figure 4 PT5200 Schematic Circuit Pane Diagram.....25
Figure 5 KBC-42A Schematic Circuit Diagram.....26

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Chapter 1 Introduction

1.1 Introduction

This manual applies to the service and maintenance of PT5200 series of FM portable radios, and is designed for the engineers and professional technicians that have been trained by Kirisun. In this manual you can find all the information of product service. Kirisun reserves the rights to modify the product structure and specification without notice in order to enhance product performance and quality. You can also log on our website www.kirisun.com to download the latest service manual or contact your local dealer or us.

Read this manual before repairing the product.

1.2 Service Precautions

Safety

Avoid skin contacting with the antenna connector and PCB.

Do not reverse the power polarities.

If signal input at antenna connector is bigger than 20dBm(100mW), it may cause damage to the radio.

Do not turn on the power before the antenna and load connection is completed.

Do not use the radio if the antenna has been damaged. Contacting the damaged antenna will cause slightly burning on the skin.

Electromagnetism Interference

It's prohibited to use or repair the radio in the following places:

Hospital, health center, air port

Any area with a potentially explosive atmosphere (where the air contains gas, dust and smog, etc.), such as the storage or transportation facilities of fuel or chemicals.

Any area of dynamite or exploder.

It's recommended to avoid using or repairing the radio in the following places:

It's recommended to avoid using the radio in a car that is moving. The radio wave might interfere the auto engine and cause it to stop working.

Component Replacement

All the components used in repair service should be supplied by Kirisun.

Other components of the same models available on the market are not surely able to use in this product and we do not guarantee the quality of the product using such components.

Please fill in a component application forms if you want to apply for any components from Kirisun.

The following is one sample form that might be used to apply for any components from Kirisun.

Component Application

Radio Model	Component	No.	Model/ Specifications	Material Serial No.	Quantity
PT5200-01	FET	Q104	RD07MVS1	105-RD07MV-001	1
PT5200-01	Triode	Q101	2SC5108(Y)	104-SC5108-001	1

1.3 Service

All the Kirisun products are subject to the service warranty.

The main unit of the radio is guaranteed for free service of 12 months. Accessories (such as battery pack, power adapter, antenna or charger) are guaranteed for free service of 6 months. Earphones are wearing parts and out of warranty.

In one of the following situations, charge free service will not be available.

No valid service warranty or original invoice.

Malfunction caused by disassembling, repairing or reconstructing the radio by the users without permission.

Wearing and tearing or any man-made damage such as mechanical damage, burning or water leaking.

Product serial number has been damaged or the product trademark is difficult to identify.

After the warranty expires, lifetime service is still available. And we also provide service components to service stations and service staff.

Chapter 2 Radio Overview and Function Keys

2.1 Radio Overview

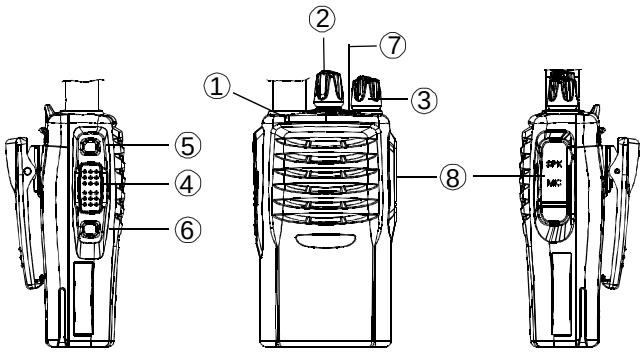

Figure2-1

① **LED Indicator**

Lights red while transmitting signals; lights green while receiving signals.

Flashes red while in low battery power during transmitting.

② **Channel Selector**

Rotate it to select channel 1-16.

③ **Power/Volume Switch**

Turn clockwise till a click is heard to switch on the radio.

Turn counterclockwise till a click is heard to switch off the radio.

Rotate it to adjust the volume after turning on the radio.

④ **PTT (Push-to-talk)**

To make a call, press and hold the PTT button, then speak into the microphone in normal voice.

Release the PTT button to receive a call.

⑤ **Side key 1**

Programmable function button: Press it to activate the programmable auxiliary function.

⑥ **Side key 2**

Programmable function button: Press it to activate the programmable auxiliary function.

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⑦ **Top Button**

Programmable function button: Press it to activate the programmable auxiliary function.

⑧ **Microphone/Speaker Jacks**

For connecting the optional Microphone/Speaker.

Chapter 3 Electrocircuit

3.1 Frequency Configuration

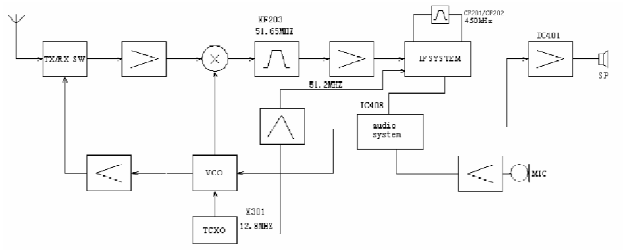

Figure 3.3 Frequency Configuration

This radio adopts the 2nd Mixer, the 1st IF 51.65MHz, the 2nd IF 450kHz.

The receiver's first local oscillation is generated by the frequency synthesizer. The second local oscillation adopts the 4th harmonic 51.2MHZ of TCXO.

The transmitter signals are generated by frequency synthesizer.

The reference frequency of frequency synthesizer is generated by TCXO.

3.2 Receiver (RX)

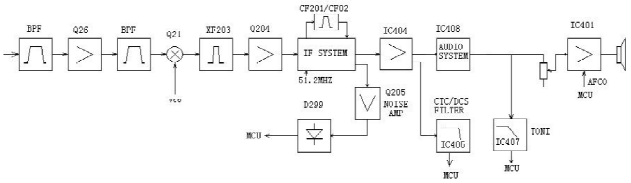

Figure 3.4 Receiver (RX)

The Receiver Front Terminal

Signals from the antenna pass through the RX/TX switch (D102, D103, D104); and then undesirable out-of-band signals will be filtered out at the band pass filter (BPF) consisting of C260, L756, L732, C259, C750,C731,D700,C730,L212,C256, C257, D210, C255, L211, C253, and D209; then signals are amplified at the low noise amplifier (LNA) consisting of Q26 and its peripheral components.

The output from the LNA passes the BPF consisting of L207, L206, L720, C248, C702, D207, C245, C244, and C733 for filtering and then is sent to the first grade frequency mixer (Q21).

The First Frequency Mixer

After mixing the receiving signals from LNA with the first local oscillation signals from the frequency synthesizer, the 1st IF signals （51.65MHz）are generated. The first IF signals pass the crystal filter (XF203), which will filter the signals of adjacent channel and those out of band.

IF Circuit

The 1st IF signals from the crystal filter are amplified at the first IF amplifier (Q204), and then are sent to the IF processing IC (IC204, TA31136FN).

The IF IC consists of the 2nd frequency mixer, the 2nd local oscillator, IF amplifier, limiter, phase frequency detector, and noise amplifier.

After amplifying TCXO (X301), the 4th harmonic 51.2MHz is made as the signal source of the 2nd local oscillation. The 2nd oscillation signal（51.2MHz）and the 1st IF signal（51.65MHz）are mixed at IC204 to generate 2nd IF（450kHz）. After the 2nd IF signal is amplified and its amplitude is limited at IC204, and then filtered at porcelain filter (wide band CF201/ narrow band CF202，450kHz), IC204 demodulates and sends out audio signals.

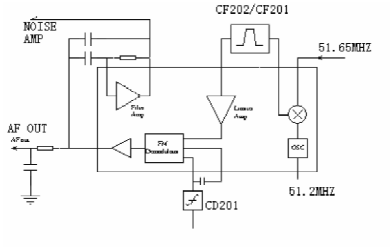

Figure 3.5 IF System

Receiver Audio Signal Processing

IC404，IC405，IC407，and IC408 and their peripheral circuit compose the receiver audio signal processing circuit. IC204 sends audio signals to IC404 for amplification, and then one route goes to IC405 (CTCSS signaling filtering circuit) for waveform shaping and then to IC6-D; one route goes to IC408 where the signals are amplified, de-emphasized, filtered and the HF (high frequency) and LF (low frequency) will be eliminated, and then for the remaining 300-3000Hz audio, one route is sent to volume potentiometer for adjustment and finally sent to the audio amplifier (IC401), and the other one route passes IC407 (2-Tone/5-Tone filter) to MCU.

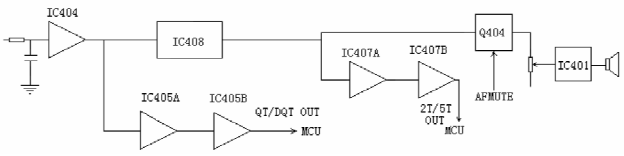

Figure 3.6 Receiver Audio Signal Processing

Squelch Circuit

Demodulation output from IC204 is sent to the selection frequency noise amplifier, which consists of IC204 inner noise amplifier and C121，R252，R211，C209，and R212 to be filtered off the noise. After being amplified at Q205, noise is sent to D299 for wave checking and then sent to MCU, which determines the noise volume to control the squelch.

Audio Amplifier

IC401 and its peripheral components construct the BTL audio amplifier.

Receiving audio signals, voice indication signals, indication tone signals and warning tone signals are collected for audio amplification to drive the speaker. Warning tone has no volume

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control.
Speaker Impedance: 16Ω
Q405: Receiving Audio Signal Switch
Notice: Any terminal of the speaker cannot be connected with the ground!

CTCSS Signal Filtering
The IC204 demodulated output audio signals may contain CTCSS (continuous tone coded squelch system) and DCS (digital coded squelch). The frequency spectrum of CTCSS/DCS is 2-250Hz. The filtering circuit constructed by IC405 can filter out the signals out of the CTCSS/DCS frequency spectrum to ensure MCU to decode CTCSS/DCS more precisely.

3.3 Transmitter (TX)
Transmitter Power Amplifier

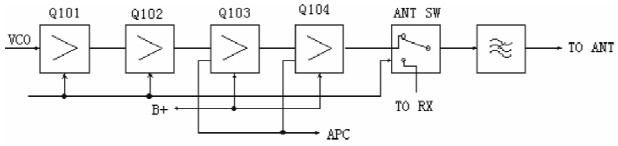

Figure 3.7 Power Amplifier and Antenna Switch Diagram

The modulated RF signals from VCO are amplified at Q101, Q102, and Q103 and then are sent to Q104 for amplification. Q104 output power: 4.5W.
The Q103 and Q104 gate offset is controlled by APC circuit. Changing gate-offset voltage can control the transmitter output power conveniently.

APC (Auto Power Control)

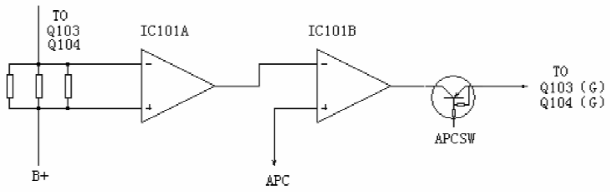

Figure 3.8 APC Circuit

R167, R168, and R169 are the amplifier current checker; IC101A is the sample amplifier of the amplification current; IC101B is the power comparison amplifier.
If the transmitter output power is too large, the amplifier current will increase, IC101A output will mount, IC101B output voltage decrease, the offset voltage added to Q103 and Q104 will decrease, and then the transmitter output power will decrease. Vice versa, such can ensure steady transmitter output power in different working circumstances.
MCU changes the input power to IC101B to set the power.

Transmitter Audio Signal Processing
R167, R168, and R169 are the amplifier current checker; IC3A is the sample amplifier of the amplification current; IC3B is the power comparison amplifier.
If the transmitter output power is too big, the amplifier current will increase, IC3A output will mount, IC3B output voltage decrease, the offset voltage added to Q11 and Q12 will decrease, and then the transmitter output power will decrease. Vice versa, such can ensure steady transmitter output power in different working circumstances.
MCU changes the input power to IC3B to set the power.

Transmitter Audio Signal Processing

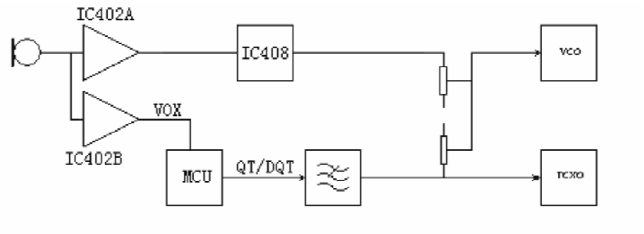

Figure 3.9 Transmitter Audio Circuit

IC402 and IC408 and their peripherals components construct the transmitter audio processing circuit. After the audio signals from MIC are amplified, one route is sent for demodulation (VOX signals) and then sent to MCU; the other one route passes AGG circuit to IC408, where the amplitude of signals is limited, and signals are filtered and amplified, and then are sent together with CTCSS/DCS to VCO for modulation.
J2 is the external MIC socket. When the external MIC is in use, the inner MIC will be cut off automatically, but inner PTT will remain activated.

3.4 Frequency Synthesizer

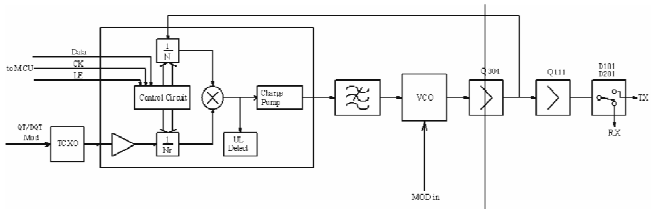

Figure 3.10 Frequency Synthesizer

The radio adopts PLL (Phase Locked Loop) frequency synthesizer.
The frequency synthesizer consists of standard oscillator, voltage controlled oscillator (VCO), programmable frequency demultiplier, phase comparator, and low pass filter.
Q302，Q307，L304，L310，D304，D302，D310，D308，C309，C310，C308，C307，C322，C323，and C321 constitute VCO.
IC301 (MB15E03SL) is PLL integrated circuit, including programmable reference frequency demultiplier, programmable swallowing frequency demultiplier, phase comparator, and charge pump.
C326，R316，C328，C327，R317，R318，and R319 construct the low pass filter.
The standard frequency is supplied by X301 (TCXO, 13MHz).
The standard frequency from TCXO (Temperature Control Transistor Oscillator) are demultiplied by the programmable reference frequency demultiplier at IC301 to acquire 6kHz or 6.5kHz reference frequency (controlled by MCU according to the preset channel frequency).
The oscillation frequency from VCO is sent to IC1, and demultiplied by swallowing frequency demultiplier and compared with reference frequency to acquire the error signals. Then pass the low pass filter

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and are sent to VCO to change VCO oscillation frequency to the preset value, and then VCO is locked.

N=FVCO/FR

N： Frequency demultiplication times

FVCO：VCO oscillation frequency

FR： Reference frequency

Check Loss of Lock: When PLL is in loss of lock, IC pin14 sends out low level signal to MCU, which controls the transmitter not to transmit and initiate warning tome.

3.5 Voice Indication Circuit

The radio features voice indication, which is very useful at night or in the environment of dim light.

MCU stores the voice indication of channels. If Channel Annunciation function has been activated, every time you change the channel, the speaker will sound voice annunciation of the current channel number.

3.6 Power Supply

The radio is equipped with 7.4V, 1200mAh Li-Ion battery. The battery supplies power directly to the transmitter amplifier circuit (Q103, Q104) and the receiver amplifier (IC401). The power supply of other circuits is the regulated 5V power.

IC502: 5V low voltage difference, micropower regulator, together with Q10, and Q30 supply big current 5V power to the whole radio.

Q502: T5V switch, controlled by MCU.

T5V: Supplies power for the front terminal of the transmitter.

Q505: R5V switch, controlled by MCU.

R5V: Supplies power for the receiver RF amplification, mixing, IF processing, audio signal processing.

Q503: C5V switch, controlled by MCU

C5V: The 5V power controlled by power saving supplies power for the frequency synthesizer.

3.7 MCU

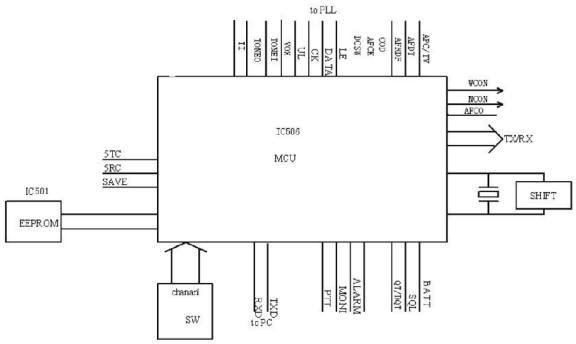

Figure 3.11 MCU Diagram

MCU controls the working of each location of the radio to realize all the radio functions.

Connects with the PC

Accesses the radio status data

Controls PLL to generate the receiving and transmitting local oscillation frequency.

Accesses the current channel status.

Controls the LED status indication

Controls the power supply of each location

Checks the action of each function key

Generates content of voice indication

Generates Power-On Indication Tone

Generates CTCSS/DCS signals

Generates 2-Tone/5-Tone signals

Generates power control signals

CTCSS/DCS decoding

2-Tone/5-Tone decoding

Squelch check and control

Samplings VOX level

Controls audio processor to conduct audio emphasis/de-emphasis, scrambler/descrambler, compander, filter and amplification.

Memorizer （E^2PROM，AT24C64）

Memorizes the radio channel data, CTCSS/DCS data, and other data of function setting and parameter adjustment.

CTCSS/DCS Encoding and Decoding

CTCSS/DCS signals generated by MCU (output form pin20 and pin26, PWM wave) are filtered at the filter circuit and then sent to VCO and TCXO for modulation.

CTCSS/DCS signals from the receiver are sent to MCU for demodulation. MCU determines whether the signals contain the same CTCSS/DCS as that set on the radio and decides whether to turn on the speaker.

Power Adjustment

MCU PIN2 sends DC signals to APC to control the transmitter output power.

CTCSS

CTCSS (continuous tone control squelch system) is a squelch control system modulated on carrier wave with continuous subaudio frequency as pilot frequency. If a channel is set with CTCSS, only when both the CTCSS of the receiver and that of the transmitter are identical, communication is available, which avoids interference of other signals.

39 groups of standard CTCSS frequency is available on the radio, see Table 3.1.

CTCSS signals generated by MCU (PWM wave) pass the low pass filter consisting of RC to be filtered off the high frequency over 300Hz and then are sent to VCO for modulation.

No.	Frq [Hz]	No.	Frq [Hz]	No.	Frq [Hz]	No.	Frq[Hz]
1	67.0	11	94.8	21	131.8	31	186.2
2	69.3	12	97.4	22	136.5	32	192.8
3	71.9	13	100.0	23	141.3	33	203.5
4	74.4	14	103.5	24	146.2	34	210.7
5	77.0	15	107.2	25	151.4	35	218.1
6	79.7	16	110.9	26	156.7	36	225.7
7	82.5	17	114.8	27	162.2	37	233.6
8	85.4	18	118.8	28	167.9	38	241.8
9	88.5	19	123.0	29	173.8	39	250.3
10	91.5	20	127.3	30	179.9		

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DCS

DCS (digital code squelch) is a kind of continuous digital code modulated with voice signals on carrier wave to control squelch.

83 groups of standard codes (positive and inverse code) are available. See table 3.2.

DCS signals generated by MCU (PWM wave shape) pass the low pass filter to be filtered off the high frequency over 300Hz and then are sent to VCO and TCXO for modulation. VCO modulates the high frequency of DCS signals; TCXO modulates the low frequency of DCS signals.

CTCSS/DCS signals from the receiver are sent to MCU for modulation. MCU determines whether the DCS encoding of the receiving signals is identical with that set on the radio and decides whether to turn on the speaker.

Table 3.2 DCS Encoding List

023	114	174	315	445	631
025	115	205	331	464	632
026	116	223	343	465	654
031	125	226	346	466	662
032	131	243	351	503	664
043	132	244	364	506	703
047	134	245	365	516	712
051	143	251	371	532	723
054	152	261	411	546	731
065	155	263	412	565	732
071	156	265	413	606	734
072	162	271	423	612	743
073	165	306	431	624	754
074	172	311	432	627	

3.9 Semiconductor Component

MCU Description

Table 3.3 Microprocessor (M30620FCPFP) Port Description

PIN	Port Name	I/O	Function
1	TONEO	O	2T/5T output，warning tone output
2	APC/TV	O	TX power/ RX sensitivity adjustment voltage output
3	AFMUTE	O	RX audio mute control output, H: audio output; L: mute
4	SHIFT	O	Frequency shift selection control
5	SAVE	O	Control Power Save mode output
6	BYTE	I	To select the width of the external data bus, high level is 8-digit width.
7	CNVSS	I	working mode switching control
8	XCIN	I	Backup clock input
9	COUT	O	Backup clock output
10	RESET	I	Reset input
11	XOUT	O	Clock output
12	GND	I	Ground
13	XIN	I	Clock input
14	VCC	I	Power positive polarity input
15	NMI	I	
16	AFRDF	I	AK2346 RDF input
17	AFDT	O	AK2346 TATA output
18	TCLCK	I	AK2346 MSK clock
19	CODIO	I/O	AK2346 DIO input
20	CTCOUT	O	QT/DQT output
21	PS	O	PLL power save mode control
22	NC	NC	NC
23	NC	NC	NC
24	NC	NC	NC
25	NC	NC	NC
26	CTC_PLL	O	QT/DQT PLL modulation output
27	TONE1	I	2T/5T input test
28	NC	NC	NC
29	TXD	O	Serial port output
30	RXD	I	Serial port input
31	CLK1	I	NC
32	RTSI	O	NC
33	EECLK	I	EEPROM clock wire
34	EEDAT	O	EEPROM data wire
35	NC	NC	NC
36	NC	NC	NC
37	NC	NC	NC
38	NC	NC	NC
39	NC	NC	NC
40	NC	NC	NC
41	NC	NC	NC
42	NC	NC	NC
43	NC	NC	NC
44	WE	I	MCU read & write control
45	NC	NC	NC
46	NC	NC	NC
47	NC	O	NC
48	NC	O	NC
49	NC	O	NC
50	EEPROMR/W	I/O	EEPROM read & write enable
51	NC	NC	NC
52	W588C		W588 audio chip control
53	SCLK588		W588 clock
54	ADA588		W58 data
55	BUSY588		W58 test
56	NC		NC
57	T/R		TX/RX VCO switching control. H：RX，L：TX
58	R5C		R5V voltage control. L：R5V output
59	PLLUS	I	Unlock check，H：Lock，L： Unlock
60	VCC	I	5V voltage input
61	T5C	O	T5V voltage control. L：T5V output
62	GND	I	GND
63	MICMUTE	O	MIC mute control。L： mute
64	PLLDAT	O	PLL data output
65	PLLCLK	O	PLL clock output
66	LE	O	PLL enabling output
67	TK	I	Key check
68	PTT	I	PTT check
69	SK1	I	Key check
70	SK2	I	Key check
71	NC	O	NC
72	NC	O	NC
73	INT		Low voltage check
74	NC	I	NC
75	WCON	O	Wide band RX control. H:effective in wide band

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76	NCON	I	Narrow band RX control. H:effective in narrow band
77	LEDR	O	RX indicator control. H：Light
78	LEDG	O	TX indicator control. H：Light
79	NC	I	NC
80	NC	O	NC
81	AFCO	O	Audio power amplifier control. L: power amplifier working
82	AFSCK	O	AK2346 data input/output clock
83	EN4	I	Channel encoding input (channel selection)
84	EN3	I	Channel encoding input (channel selection)
85	EN2	I	Channel encoding input (channel selection)
86	EN1	I	Channel encoding input (channel selection)
87	NC	I	NC
88	NC	I	NC
89	NC	I	NC
90	TI	I	CTCSS/DCS input
91	RSSI	I	RX field strength signal input
92	BATT	I	Battery voltage check input
93	VOX	I	VOX voltage check input
94	GND	I	GND
95	SQL	I	Squelch voltage check input
96	VCC	I	5V voltage input
97	VCC	I	5V voltage input
98	AFDIR	O	AK2346 data input/output control pin
99	APCSW	O	TX power adjustment voltage input control switch. H：Control is effective
100	DCSW	O	TX power output control. L: TX power output enabling

3.4 Semiconductor Function Description

Position	Type	Function Description
IC301	MB15E03SL	Frequency synthesizer
IC101	NJM2904	APC, voltage comparison, drive
Ic204	Ta31136	Receiver's 2nd local oscillation, 2nd IF amplification, amplitude limit, demodulation, noise amplification
IC408	AK2346	Audio processing
IC402	TC75W51FU	MIC amplification
IC401	TDA2822D	Receiver audio power amplifier
Ic9	AT2432NI	E^2PROM, memory channel frequency data, function setting parameter, debugging state parameters
IC10	M30620FCPFP	MCU
IC505	R3111N45IC	MCU reset circuit
Q101	2SC5108	Transmitter 1st amplification
Q102	2SC3356	Transmitter 2nd amplification
Q304	2SC5108	VCO buffering amplifier
Q111	2SC5108	VCO buffering amplifier
Q306	2SC4617	VCO power filter
Q205	2SC2412K	Noise amplifier
Q10	2SC1623	5V regulated output current stretcher
Q104	RD07MVS1	Transmitter final power amplifier
Q103	RD01MUS1	Transmitter power amplifier drive
Q107	DTA144EE	APC output switch
Q21	3SK318	The 1st frequency mixer
Q26	3SK318	Receiver HF amplifier
Q204	2SC5108	The 1st IF amplifier
Q507	DTC144EE	Red LED drive
Q06	DTC144EE	Green LED drive
Q503	2SJ243	C5V switch
Q502	2SA1745	T5V witch
Q504	2SJ243	R5V switch
Q405	DTC144EE	Receiver audio output switch，cut off when in emergency mode.
Q404	2SK1824	Receiver audio output switch.

Table 3.5 Diode Function Description

Position	Type	Function Description
D102	MA77	Transmitter antenna switch diode
D101	HSC277	VCO output switch
D103	HSC277	Antenna switch
D104	HSC277	Antenna switch
D201	HSC277	VCO output switch
D302	MA2S376	VCO oscillation variable capacitance diode
D304	MA2S376	VCO oscillation variable capacitance diode
D305	MA360	VCO modulation diode
D310	MA2S376	VCO oscillation variable capacitance diode
D308	MA2S376	VCO oscillation variable capacitance diode
ZD101	HZU5ALL	APC output voltage-limiting diode
D311	MA2S111	Loss of lock check diode
D306	MA2S111	VCO power filtering accelerating diode
D299	1N4148	Noise demodulation
D508	LED Red	Transmitting indication
D509	LED Green	Receiving Indication
D505	LED Red	Transmitting indication
D506	LED Green	Receiving Indication

Table3.6：XF 203 Crystal Filter Features

Item	Specified Value
Nominal center frequency	51．65MHz
Transmission bandwidth	±7.5kHz or bigger, within 3dB
40dB barrage bandwidth	±20.0kHz or smaller
Pulse	1.0dB or smaller
Insertion loss	3.0dB or smaller
Guarantee attenuation	80dB or bigger, within fo-910kHz
Terminal resistance	1.5kΩ/6PF

Table 3.7 CF201 LTWC450F Features

Item	Specified Value
Nominal center frequency	450kHz
6Db bandwidth	±5.0kHz or bigger
50dB bandwidth	±13.5kHz or smaller
Pulse	3.0dB or smaller z
Insertion loss	7.0dB or smaller
Guarantee attenuation	45.0dB or bigger, f0±100kHz

Table 3.8 CF202 LTWC450G Features

Item	Specified Value
Nominal center frequency	450kHz
6Db bandwidth	±3.5kHz or bigger
50dB bandwidth	±12kHz or smaller
Pulse	3.0dB or smaller
Insertion loss	7.0dB or smaller
Guarantee attenuation	45.0dB or bigger, f0±100kHz

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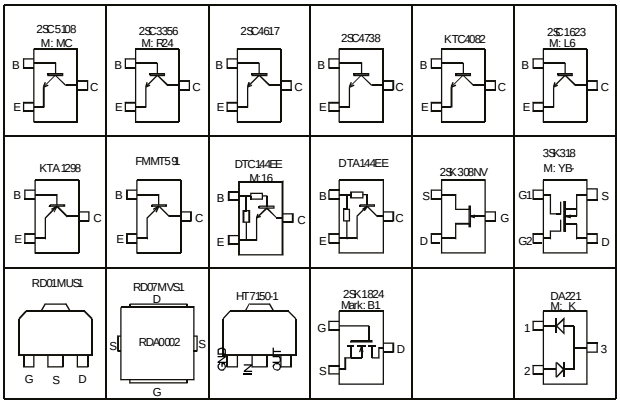
Figure 3.8 Semiconductor Component Packaging Illustration：



Chapter 4 Function Description and Parameter Setting

4.1 Major Functions

4.1.1 16 Channels

The radio stores 16 channels.

4.1.2 Scan Channel (programmable by PC software)

a) Press the key designated as “Scan” to activate scanning. While in scanning, the radio checks every channel and stops on the channel on which a signal is detected until that signal disappears. If the delay time between signal disappearing and continuing scanning has been preset, the radio will remain on that channel in the delay time even receiving any signals at that time.

Only when there are two channels added in the scan list and the scan function has been activated, the radio can start scanning.

b) The dealer can set the revert channel (transmitting channel) in scanning among the following options:

1) **Selected:** The radio always reverts to the channel selected before scanning when pressing PTT.

2) **Selected + Talk Back:** When the radio is in scanning, press the PTT button and the radio will transmit signals on the selected channel.

When the radio is in scanning pause, press the PTT button and the radio will transmit signals on the current talk back channel.

3)**Priority:** When pressing PTT, the radio will transmit signals on the priority channel in the scanning list.

4) **Priority + Talk Back:** When the radio is in scanning, press the PTT button and the radio will transmit signals on the priority channel. When the radio is in scanning pause, press the PTT button and the radio will transmit signals on the current talk back channel.

5) **Last Called:** When pressing PTT button, the radio will transmit from the last channel that received a call. If it has never received any calls, it will revert to the first channel in the scanning list.

6) **Last Used:** When pressing PTT button during the scanning, the radio will transmit from the last channel that you used to transmit. If it has never made any calls, it will revert to the first channel in the scanning list

c) Priority Scan

During scanning, if the priority channel has been set on the radio, when the priority channel receives a signal the radio will automatically switch to the priority channel even the normal channel is receiving signals at that time. And the radio will stay on the priority channel till that signal disappears. The dealer can set the delay time between signal disappearing and continuing scanning.

d) Temporarily Delete

When scanning pauses on a channel,channel, press and hold the button programmed as “Temporarily Delete” or “Scan + Temporarily Delete” for 1 second to delete this channel temporarily from the scanning list.

Note: The priority channel cannot be deleted. And when the number of scanning channels is less than 2, you cannot delete any channel, either.

After exiting scanning mode and entering it again, the temporarily deleted channel will be added in the scanning list again.

4.1.3 CTCSS/DCS

CTCSS/DCS can realize selective calls and group calls. On the same channel, only the two parties whose CTCSS/DCS are identical can communicate. CTCSS/DCS signaling code on the channel is preset.

4.1.4 TOT

The purpose of the time-out timer is to prevent any single person from overlong using a channel to transmit and affecting the whole group communication.

If the radio transmits longer than the preset TOT time limit, the radio will stop transmitting and warning tone sounds. To stop the warning tone, release the PTT button. Press the PTT again you can resume transmitting.

TOT Pre-Alert:

You can set the time when the radio generates a "Pre-Alert tone", before the TOT (Time Out Timer) expires. TOT will expire when the selected time passes after a “Pre-Alert Tone”.

TOT Rekey Time:

TOT Rekey-Time sets the "penalty" time in which the radio cannot be re-keyed for transmitting after the Time Out Timer setting is exceeded. During the Rekey time, if you press PTT, warning tone sounds and transmission is prohibited.

TOT Reset Time:

TOT Reset Time sets the minimum "wait" time allowed between transmissions that will reset the Time Out Timer. After setting this, TOT continues even after PTT is released unless the TOT Reset Timer has expired.

4.1.5 Auto Power Save

When no signals are being received or no operations are being conducted for over 10 seconds, the battery power saving will be activated to reduce power consumption. When it is receiving signals or in operating state, battery power saving is inactive.

Power Save Type: 1:1, 1:2, 1:4, and OFF.

4.1.6 Low Battery Warning

When the battery power appears low, the indicator flashes. If the battery power is lower than the preset value during transmitting, the status indicator flashes red. When the speaker sounds warning tone, the radio will stop transmitting.

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4.1.7 Monitor

When no signals are being received, the radio squelch circuit mutes the speaker.

Press the MONI key to cut off the squelch control circuit, and you will hear noise from speaker (no mater whether there are signals). Such operation is very useful when you want to adjust voice volume or receive weak signals (to avoid voice intermittence when in weak signals).

When you press the MONI key, the green indicator lights, and the radio is in the state of monitoring.

4.1.8 、 5-Tone Signaling

The dealer can activate or inactivate this function by programming.

5-Tone Signaling has 17 coding formats: CCIR1, CCIR2, PCCIR, ZVEI1, ZVEI2, ZVEI3, PZVEI, DZVEI, PDZVEI, EEA, EURO SIGNAL,NATEL, EIA, CCITT, MODAT, USER DEFINED1, and USER DEFINED2. The last two are customized models.

1) 5-Tone Decoding

When receiving proper 5-tone signal, squelch will be activated according to the “SP unmute” set by the user, and the radio can receive the call and orange LED flashes.

The dealer can program the response way after decoding succeeds.

2) 5-Tone Encoding:

If the PTT ID on the channel you select has been set with 5-Tone, 5-Tone signal will be transmitted when making a call.

Or transmit 5-Tone signal by pressing the PTT button and CALL1 or CALL2 button, which can be set by the dealer.

4.1.9、 2-Tone Signaling

The dealer can activate or inactivate this function by programming.

1) 2-Tone Decoding

When receiving proper 2-Tone signal, squelch will be activated according to the “SP unmute” set by the user, and the radio can receive the call and orange LED flashes.

The dealer can program the response way after decoding succeeds.

2) 2-Tone Encoding:

If the PTT ID on the channel you select has been set with 2-Tone, 2-Tone signal will be transmitted when making a call.

Or transmit 2-Tone signal by pressing the PTT button and CALL1 or CALL2 button, which can be set by the dealer.

4.1.10、 PC Programmable

You can program the radio functions and adjust some parameters by PC programming software KSP5200.

4.1.11、 Busy Channel Lockout

If “busy channel lockout” has been activated, transmitting signals is prohibited on the busy channel. If you press the PTT to transmit on the busy channel, the speaker will sound busy channel lockout tone, and you cannot transmit signals.

The dealer can set one of the following BCL types:

1) OFF: BCL is inactive and you can transmit on the busy channel.

2) Carrier wave: If carrier wave is detected, the radio is unable to transmit.

3) CTCSS/DCS: The radio is allowed to transmit when the CTCSS/DCS signalings are identical.

4) Selective signaling: The radio is allowed to transmit when the selective signalings (2-Tone or 5-Tone) are identical.

4.1.12 Squelch Level Selection

The purpose of the squelch is to mute the speaker noise when no signals are received or the signals are weak. When the squelch is activated, you can hear noise from the speaker; when the squelch is inactivated, you will not hear noise form the speaker. Selecting the squelch level is to select which the signal strength level is strong enough to enable the squelch or weak enough to disable the squelch. Over high squelch level will make the radio unable to receive signals efficiently when signals are weak; over low squelch level will make the radio communication affected by noise or other irrelevant signals. The squelch level has 0-9 options.

4.1.13 Beep Tone

This option controls power on tone, channel busy tone and TOT tone.

4.2 Parameter Setting (PC Mode)

The radio parameters have been programmed in the factory. The user can program the radio parameters such as working frequency, channels, CTCSS/DCS, auto scanning. We designed a user friendly and convenient Chinese/English programming software KSP20 for users to set parameters on the radio. The programming steps are as follows:

A. Install the programming software KSP 5200 on the computer.

b. Connect the radio to the computer serial port with the specified programming line (KSPL02). See Figure 4.1

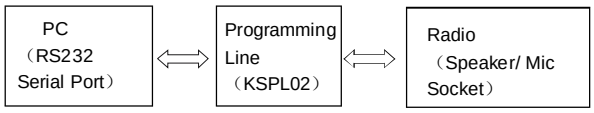

Figure 4.1

C. Turn on the computer power.

D. Turn on the radio power.

E. Click the KSP5200 program to run the programming software.

F. Click the “Program” in the KSP5200 pull-down menu, and click “Read from Radio” to read the radio parameters into the computer; click “Write to Radio” to transfer the PC programming parameters into the radio.

G. You can program the following parameters with the KSP5200 software.

1) The RX and TX frequency of each channel.
2) The receiving and transmitting signaling of each channel.
3) Busy channel lockout option.
4) TOT
5) Squelch level option.
6) 5-Tone
7) 2-Tone
8) Power saving option.
9) Beep tone option.
10) Monitor mode option.
11) Scan mode option.
12) Scan the revert channel option.
13) Scan the priority channel option.

For more details, please refer to the “Help” in the KSP5200 software.

Notice:

1) Turn off the radio before connection.

2) When the radio is being read data, the indicator lights green and

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it's prohibited to press the PTT button; when the radio is being written data, the indicator lights red.
3) Before the first time editing, you should read data form the radio and backup the data.
4) If the radio cannot work normally after being written in with the editing data, open the data backup and rewrite the backup into the radio.
5) Model information is important radio data and is prohibited to modify.
6) After programming, you need to turn on the radio power again to make the radio resume the normal work.

4.3 Computer Test Mode:

Connect the radio to the radio communication port with the specified programming line (KSPL02). See Figure 4.1.
Warning: Before entering the computer test mode, connect a HF load of 50Ω to the radio antenna connector or connect the radio to a comprehensive test device.
Under the computer test mode, you can modify the following parameters with KSP5200 programming software:

1) TX/RX low voltage
2) High/Medium/Low power
3) AK2346 VR 1/ 2 / 3 / 4
4) DCS (DQT) balance
5) DCS (DQT) frequency deviation
6) CTCSS (QT) frequency deviation
7) DTMF frequency deviation
8) Tone frequency deviation
9) MSK frequency deviation
10) VOX gaining
11) Sensitivity
12) SQL 1/9（OPEN/SQUELCH）

4.4 Wired Clone (It can be prohibited by programming software)

When the wired clone function is activated, the radio can enter the wired clone mode. After entering the wired clone mode, the radio will not exit it automatically and you have to turn on the radio again to enter the user's mode. Operating steps are as follows:
1) Turn on the radio with the MONI key pressed, and 2 seconds later the red light flashes twice and two beep tones sound, and then the radio enters the wired clone mode.
2) Press the PTT button on the host radio to activate/inactivate the wired clone mode on the sub radio. But the wired clone mode of the host radio will not be changed. When pressing the PTT button, the green light flashing twice and one beep mean to activate the clone mode on the sub radio; the red light flashing twice and two beeps mean to inactivate the clone mode on the sub radio.
3) Press the MONI key, red light flashes, and it starts cloning. After cloning is finished, the red light turns dim.

Note:

You can also activate/inactivate the wired clone mode by PC programming software.
If the wired clone function has been prohibited, it cannot enter the wired clone mode.

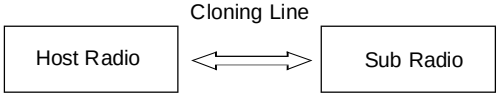

Figure 4.2

Chapter 5 Service Assemble and Disassemble

The radio is precision communication equipment. Please be careful when assemble or disassemble the radio during service.

5.1 Removing and Installing the Battery

To remove the battery, push the latch upwards and remove the battery away from the radio. (See Figure 5.1)

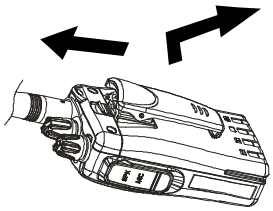

Figure 5.1

To install the battery, match the tow bulges at the bottom of the battery with the corresponding grooves at the radio aluminum alloy frame and insert it in. Then press the upper end of the battery till the latch secure. (See Figure 5.2 and 5.3)

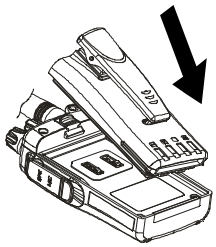

Figure 5.2

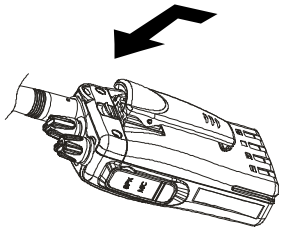

Figure 5.3

5.2 Removing and Installing the Belt Clip

To remove the belt clip, use your nail or a tool to lift the metal spring piece in the belt clip from the topside, and then pull the belt clip away from the radio.
To install the belt clip, match the upper head of the belt clip with the glides on the rear of the battery, and then press the belt clip downwards to lock it in place. (See Figure 5.4)

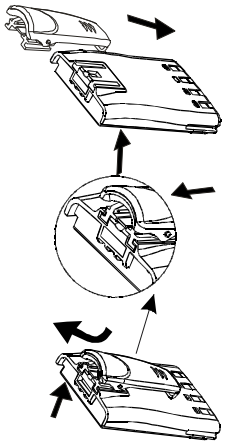

Figure 5.4

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5.3 Removing the Casing from the Chassis

1) Remove the knobs;
2) Remove the two knob nuts and the antenna nut;
3) Remove the two cross head screws that fix the top cover at the top;
4) Remove the two cross head screws that fix the aluminum alloy frame at the bottom;
5) Pull the aluminum alloy frame out of the casing.

See Figure 5.5

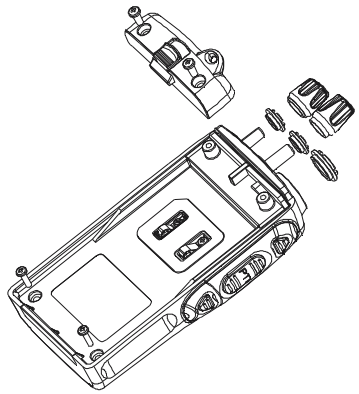

Figure 5.5

5.4 Remove the Chassis from the Main Board

1) Remove the screw of from the PCB;
2) Melt the solder at the antenna point with an electric soldering iron and take off the main board;
3) Take away the two screws and the antenna connector.

See Figure 5.6.

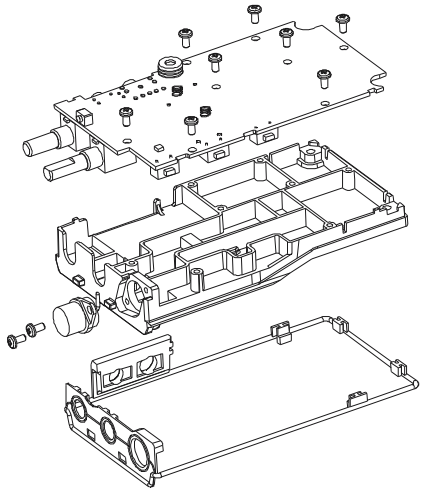

Figure 5.6.

5.4 Exploded View

No.	MATERIAL No.	DECRIPTION	QTY
1	201-000668-R04	PTT COVER BOARD	1
2	201-000668-R05	PTT PLASTIC KEYSTROKE	1
3	202-000668-R01	PTT KEYSTROKE	1
4	203-000558-R04	SPEAKER SPRING	2
5		LOGO LABLE	1
6	201-005200-R01	SURFACE SHELL	1
7	121-100000-R07	SPEAKER	1
8	204-000558-R01	WATERPROOF WASHER	2
9	201-000558-R09	LIGHT POLE	1
10	202-000558-R05	ANTENNA WATERPROOF WASHER	1
11	202-000558-R04	SWITCH WATERPROOF WASHER	2
12	203-000558-R01	ANTENNA NUT	1
13	203-000558-R02	SWITCH NUT	2
14	203-003208-R09	KNOB RETAINING RING	2
15	201-000668-R03	ENCODER KNOB	1
16	201-000668-R02	VOLUME KNOB	1
17	202-000558-R03	ANNUNCIATOR KEYSTROKE	1
18	201-000558-R08	ANNUNCIATOR KEYSTROKE STAKE	1
19	202-000558-R01	MIC COVER	1
20	204-006800-R06	MIC WASHER	3
21	202-000558-R09	MIC UNDERLAY	1
22	301-20040G-R01	SCREW M2	10
23		PCB SUBASSEMBLY	1
24	204-000558-R04	WASHER	2
25	204-003208-R05	WASHER	2
26	202-000558-R06	WASHER	1
27	201-000558-R07	ANODE SHRAPNEL BRACKET	1
28	202-000558-R08	ANODE CATHODE WASHER	2
29	203-003208-R02	ANODE SHRAPNEL	1
30	302-17040G-R01	SCREW M1.7	1
31	202-003208-R07	INSULATING WASHER	1
32	202-000558-R07	WATERPROOF WASHER	1
33	203-000558-R07	ANTENNA HEAD	1
34	204-000558-R05	ALNICO AEGIS PASTER	1
35	203-004200-R01	ALNICO BRACKET	1
36	203-003208-R04	CATHODE SHRAPNEL	1
37	201-000558-R05	COPING	1
38	203-000558-R05	PUSH FASTENER SPRING	1
39	201-000558-R06	PUSH FASTENER	1
40	301-25060J-R01	SCREW M2.5	2
41	204-000558-R02	WATERPROOF WASHER	1
42	401-0201C1-R06	ALNICO LABLE	1
43	301-20080G-R01	SCREW M2	2
44	204-000558-R03	BUTTOM LABLE	1

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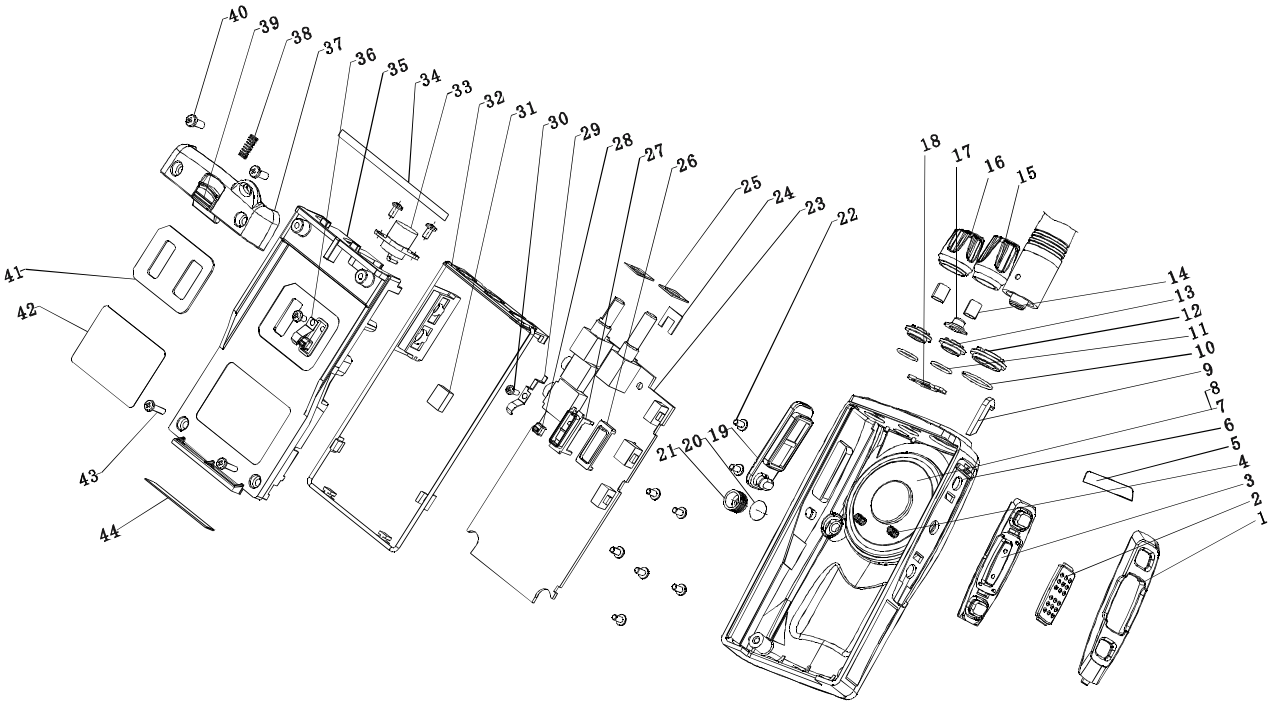

Figure 5.7 Exploded View

5. 6 Wearing Parts List

No.	Material Serial No.	Name	QTY
1	111-030000-R03	Chip protective tube	FS01
2	110-220103-R12	Volume switch	K501
3	106-ED0873-R01	Channel/Encoder switch	K502
4	124-050000-R05	Earphone rod bearing	J401
5	124-050000-R04	MIC rod bearing	J402
6	604-052000-R01	PT5200 front cover components	1
7	202-000558-R01	PT558 earphone/Mic cover	1
8	202-000668-R01	PT668PTT rubber key	1
9	201-000668-R05	PT668PTT key	1
10	201-000668-R04	PT668PTT cover	1
11	604-006680-R02	PT668 Volume knob module	1
12	604-006680-R03	PT668Channel knob module	1
13	203-000558-R11	PT558 Antenna knob	1
14	203-000558-R02	PT558 Switch knob	2
15	204-003208-R05	PT3208 Potention meterention meter washer	2
16	202-000558-R04	PT558 switch waterproof gasket	2
17	202-000558-R05	PT558 antenna waterproof gasket	1
18	203-000558-R07	PT558 antenna connector	1
19		PT5200 electrical material	1
20	202-000558-R09	PT558 MIC cover	1
21	301-20040G-R01	M2.0*4.0 Woven belly-tooth screw	10
22	604-005580-R04	PT558 Positive pole terminal module	1
23	301-20080G-R02	M2.0*8.0 Woven belly-tooth screw	2
24	604-005580-R05	PT558 Al alloy chassis	1
25	301-25050J-R01	M2.5*5.0 Woven belly-tooth screw	2
26	604-005580-R06	PT558 Top cover module	1
27	202-000558-R07	PT558 Large waterproof gasket	1
28	121-100000-R07	Speaker	1
29	201-000558-R08	PT558 Emergency Key Panel	1
30	201-000558-R09	PT558 Light guide lens	1
31	201-005200-R02	PT5200 Front cover	1
32	202-000558-R03	PT558 Emergency Key	1
33	204-000558-R01	PT558 Speaker waterproof net	1
34	204-006800-R06	PT6800 MIC gasket	3
35	201-000668-R03	PT668 Channel knob	1
36	203-003208-R09	PT3208 Knob retaining ring	1
37	201-000558-R07	PT558 Positive pole terminal chassis	1
38	202-000558-R06	PT558 chassis waterproof gasket	1
39	202-000558-R08	PT558 Positive pole terminal gasket	1
40	203-003208-R02	PT558 Positive pole terminal	1
41	302-17040G-R01	Screw	1
42	202-000558-R08	PT558 Positive/Negative pole terminal gasket	1
43	203-003208-R04	PT3208 Negative pole terminal	1
44	203-004200-R01	PT4200 Al alloy chassis	1
45	204-000558-R02	PT558 waterproof spacer	1
46	204-000558-R03	PT558 Al alloy sticker	1
47	204-000558-R05	PT558 Al alloy spacer	1
48	301-20030G-R03	Screw	1
49	201-000558-R05	PT558 Top cover	1
50	202-000558-R14	PT558 Push fastener	1
51	203-000558-R05	PT558 Push fastener spring	1

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Chapter 6 Radio Debugging

Before test/debugging, make sure all the equipments have been well connected to the ground.
Before test/debugging, make sure the antenna output terminal has been connected properly to the corresponding devices and load.
The transmitter output must pass RF power attenuator before being connected to the standard signal source/ frequency deviator/ frequency spectrum.
When testing the receiver, make sure not to conduct transmitting operation.
When in debugging/testing/service, make sure static free measures for human body and equipments.

6.1 Service Equipment and Software.

The following equipments and software in Table 6.1 are necessary for the service and test of the radio.

Table 6.1 For Test and Service： Equipment and Software

No.	Item	Specifications
1	Computer	Higher than P2, compatible with IBM PC, WINDOWS 98/ME/2000/XP
2	Programming Software	KSP-5200
3	Programming Line	KSPL02
4	Cloning Line	KCL01
5	DC Regulated Power	Output voltage：7.5V, Output current：≥ 5A
6	RF power meter	Test range：0.5---10W Frequency range：100MHz500MHz Impedance：50Ω SWR≤1.2
7	Frequency Meter	Frequency range： 0.1600MHz Frequency precision: Higher than ± 1×10^{-6} Sensitivity： Higher than 100mV
8	Frequency Deviator	Frequency range：DC600MHz Test range：0--±5kHz
9	Digital Multimeter	Input impedance：Higher than 10MΩ/V DC， with the ability of testing voltage, current, impedance.
10	Audio Signal Generator	Frequency range： 2---3000Hz Output level： 1---500mV
11	RF power Attenuator	Attenuation：40dB or 50dB Supporting power：Bigger than 10W
12	Standard signal source	Frequency range：10MHz---1000MHz Output level：0.1uV~32mV (-127dBm~-17dBm)
13	Oscillograph	Frequency range： DC~20MHz Test range：10mV~20V
14	Audio voltmeter	Test range：10mV~10V

The equipments in item 6, 7, 8, 10, 11, and 12 can be replaced by a comprehensive test instrument.

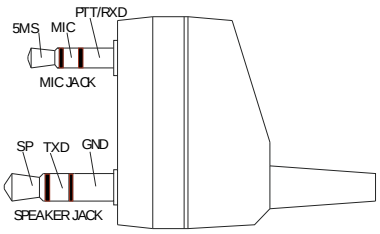

Figure 6.1 External Speaker/Mic Connector Definition

6.2 Debugging Items

During the course of maintenance, the radio needs to be tested and debugged after replacing components. Some certain radio parameters can be modified (computer mode) with our KSP 5200 programming software. The modifiable parameters are as follows:

1) Frequency difference
2) TX power
3) Low battery power warning threshold
4) Squelch level
5) CTCSS (QT) frequency deviation
6) DCS (DQT) frequency deviation
7) TX frequency deviation
8) DTMF frequency deviation
9) TONE frequency deviation
10) RX sensitivity
11) RX AF power

Debugging Procedures

a. Enter the computer test mode. Access method refers to the instruction in 4.2.1 parameter setting.
b. Select the “Test Mode” option is KSP5200 program to enter the computer test mode.
c. Select the options that you want to adjust and adjust the parameters on the computer.
d. After adjustment, exit the computer test mode.

6.3 Debugging

6.3.1 TX Low Power Warning

Adjust the voltage to 6.6V.
In “Test Mode” press “↓” to select “TX lower power” and press Enter key.

6.3.2 VCO Modification

Turn off the power saving mode. Set the RX frequency at the low frequency (see Table 6.2). In receiving status, test the PD power with the digital multimeter. Adjust the trimming capacitor TC302 to make the PD power at 1V±0.1V. Set the RX frequency at the high frequency, and PD power is 3.5V±0.1V.
Set the TX frequency at low frequency (see Table 6.2), press the PTT button, test the PD power with the digital multimeter. Adjust the trimming capacitor TC301 to make the PD power at 1V±0.1V. Set the TX frequency at the high frequency, and PD power is 3.5V± 0.1V.

Table 6.2 Radio H/I/L Frequency

	Low Frequency	Medium Frequency	High Frequency
TX	420.165MHz	445.165MHz	469.965MHz
RX	420.165MHz	445.165MHz	469.965MHz

6.3.3 PLL Frequency Adjustment

Under the computer test mode, press “↓” on the keyboard to enter “Low Power (Low)” and press Enter. Adjust VR1 to make the TX frequency error at +/-200HZ.

6.3.4 TX Frequency Adjustment

Under the computer test mode, press “↓” on the keyboard to enter “Low Power (Low)” and press Enter. Press “←/→” key to make the TX power at 0.5+/-0.1w and then press Enter to store the setting. Use the same way to adjust “Low Power (Medium), Low Power (Medium High), Low Power (High)” at 0.5+/-0.1w.

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Press “↓” on the keyboard to enter “Medium Power (Low)” and press Enter. Press “←/→” key to make the TX power at 2+/-0.2w and then press Enter to store the setting. Use the same way to adjust “Medium Power (Medium), Medium Power (Medium High), Medium Power (High)” at 2+/-0.2w.
Press “↓” on the keyboard to enter “High Power (Low)” and press Enter. Press “←/→” key to make the TX power at 4+/-0.3w and then press Enter to store the setting. Use the same way to adjust “High Power (Medium), High Power (Medium High), High Power (High)” at 4+/-0.3w.

6.3.5 Frequency Deviation Adjustment

Input 150mV, 1000Hz audio signals from the radio MIC, and press “↓” to enter “AK2346 VR2 Wide Band Low” and press Enter. Press “←/→” key to make the maximum frequency deviation at 3.9+/-0.2KHZ.
Use the same way to make the maximum frequency deviation of “AK2346 VR2 Wide Band Medium”, “AK2346 VR2 Wide Band High” at 3.9+/-0.2KHZ; “AK2346 VR2 Medium Band Medium” at 3.2+/-0.1KHZ; “AK2346 VR2 Narrow Band Medium” at 2.0+/-0.2KHZ. (Notice: On the comprehensive test device, the audio output level is 150mv and the filter is set to 50HZ~15K.)

6.3.6 DCS (DQT) TX Signal Wave Shape and Frequency Adjustment

Under the computer test mode, press “↓” on the keyboard to enter “DCS Frequency Deviation (Wide, Low)” and press Enter. Press “←/→” key to make the DCS Frequency Deviation at 0.85+/-0.15KHZ. Use the same way to adjust “DCS Frequency Deviation (Wide, Medium)” “DCS Frequency Deviation (Wide, High)” at 0.80+/-0.10KHz; “DCS Frequency Deviation (Medium, Medium)” at 0.6+/-0.1KHz; “DCS Frequency Deviation (Narrow, Medium)” at 0.4+/-0.1KHz. (Notice: The filter is set to 20HZ~300HZ.)

6.3.7 CTCSS (QT) Frequency Deviation Adjustment

Under the computer test mode, press “↓” on the keyboard to enter “CTC Frequency Deviation (67.0HZ ,Wide, Low)” and press Enter. Press “←/→” key to make the CTC Frequency Deviation at 0.80+/-0.10KHZ. Use the same way to adjust “CTC Frequency Deviation (67.HZ ,Wide, Medium)”, “CTC Frequency Deviation (67.HZ, Wide, High)” at 0.80+/-0.10KHZ; “CTC Frequency Deviation (67.0HZ, Medium, Medium)” at 0.6+/-0.1KHZ; “CTC Frequency Deviation (67.0HZ, Narrow, Medium)” at 0.4+/-0.1KHZ; the test and specifications are the same for “CTC Frequency Deviation (136.5HZ) and ” CTC Frequency Deviation (254.1HZ). (Notice: The filter is set to 20HZ~300HZ.)

6.3.8 DTMF Frequency Deviation Adjustment

Under the computer test mode, press “↓” on the keyboard to enter “DTMF Frequency Deviation (Wide Band)” and press Enter. Press “←/→” key to make the DTMF Frequency Deviation at 3+/-0.3KHZ.
Press “↓” on the keyboard to enter “DTMF Frequency Deviation (Medium Band)” and press Enter. Press “←/→” key to make the DTMF Frequency Deviation at 2.3+/-0.2KHZ.
Press “↓” on the keyboard to enter “DTMF Frequency Deviation (Narrow Band)” and press Enter. Press “←/→” key to make the DTMF Frequency Deviation at 1.5+/-0.1KHZ.

6.3.9 TONE Frequency Deviation Adjustment

Under the computer test mode, press “↓” on the keyboard to enter “TONE Frequency Deviation (Wide Band)” and press Enter. Press “←/→” key to make the TONE Frequency Deviation at 3+/-0.3KHZ.
Press “↓” on the keyboard to enter “TONE Frequency Deviation (Medium Band)” and press Enter. Press “←/→” key to make the TONE Frequency Deviation at 2.3+/-0.2KHZ.
Press “↓” on the keyboard to enter “TONE Frequency Deviation (Narrow Band)” and press Enter. Press “←/→” key to make the TONE Frequency Deviation at 1.5+/-0.1KHZ.

6.3.10 VOX Gain Debugging

Under the computer test mode, press “↓” on the keyboard to enter “VOX Gain 5 (Medium)” (set the output level on the comprehensive test device to 15mv) and press Enter to store the data ----- do not press Enter until the numbers on the screen become steady.
Press “↓” on the keyboard to enter “VOX Gain 1 (Medium)” (set the output level on the comprehensive test device to 100mv) and press Enter. Do not press Enter to store the data until the numbers on the screen become steady.

6.3.11 Receiver Sensitivity

Under the computer test mode, set the comprehensive test device at the sate of testing pass band, and press “↓” on the keyboard to enter “Receiver Sensitivity (Low)” and press Enter. Press “←/→” key to make the frequency waveform to the middle of the whole waveform. Then press Enter to store the data. It's the same to other 4 testing points (notice the corresponding frequency change).

6.3.12 AK2346 Receiving Voice Debugging

Under the computer test mode, set the RX frequency on the comprehensive test device to the middle frequency among the 5 testing frequency points; signal strength at 1mv; AF voltage unit is “W”.
Press “↓” on the keyboard to enter “AK2346 VR3 (Wide Band, Medium)” and press Enter. Press “←/→” key to make the AF power to 0.4+/-0.05W. Set the AF power of “AK2346 VR3 (Medium Band, Medium)” and “AK2346 VR3 (Narrow Band, Medium)” to 0.4+/-0.05W. (On the comprehensive test device, the AF deviation is 3KHZ, 2.5KHZ, and 1.5KHZ separately.)

6.3.13 Receiver Squelch Setting

Under the computer test mode, press “↓” on the keyboard to enter “SQL 1 ON (Wide Band, Low)” (on the comprehensive test device the RX frequency is low frequency, SIAND is adjusted to 10dB). Press Enter to watch the RX sensitivity and press Enter to store the data after the value becomes steady. It's the same for “SQL 1 ON (Wide Band, Medium Low)”, “SQL 1 ON (Wide Band, Medium)”, “SQL 1 ON (Wide Band, Medium High)”, and “SQL 1 ON (Wide Band, High)”. (On the comprehensive test device, the AF deviation is 3KHZ, 2.4KHZ, and 1.5KHZ separately.)

Press “↓” on the keyboard to enter “SQL 1 OFF (Wide Band, Low)” (on the comprehensive test device the RX frequency is low

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frequency, SIAND is adjusted to 8dB. Press Enter to watch the RX sensitivity and press Enter to store the data after the value becomes steady. It's the same for "SQL 1 OFF (Wide Band, Medium Low)", "SQL 1 OFF (Wide Band, Medium)", "SQL 1 OFF (Wide Band, Medium High)", and "SQL 1 OFF (Wide Band, High)".

Press "↓" on the keyboard to enter "SQL 9 ON (Wide Band, Low)" (on the comprehensive test device the RX frequency is low frequency, SIAND is adjusted to -117dB). Press Enter to watch the RX sensitivity and press Enter to store the data after the value becomes steady. It's the same for "SQL 9 ON (Wide Band, Medium Low)", "SQL 9 ON (Wide Band, Medium)", "SQL 9 ON (Wide Band, Medium High)", "SQL 9 ON (Wide Band, High)", "SQL 9 OFF (Medium Band, Medium)" and "SQL 9 OFF (Narrow Band, Medium)".

Press "↓" on the keyboard to enter "SQL 9 OFF (Wide Band, Low)" (on the comprehensive test device the RX frequency is low frequency, SIAND is adjusted to -119dB. Press Enter to watch the RX sensitivity and press Enter to store the data after the value becomes steady. It's the same for "SQL 9 OFF (Wide Band, Medium Low)", "SQL 9 OFF (Wide Band, Medium", "SQL 9 OFF (Wide Band, Medium High)", "SQL 9 OFF (Wide Band, High)", "SQL 9 OFF (Medium Band, Medium)" and "SQL 9 OFF (Narrow Band, Medium)".

Chapter 7 Technical Specifications

7.1 General Specification

Frequency (MHz)	136~174MHz	470~512 MHz
	400~450MHz	350~390 MHz
	420 ~ 470MHz	
Modulation	16K0F3E	
Number of Channels	16	
Channel Spacing	25 kHz (W), 20 kHz (M), 12.5 kHz (N)	
MF	1st MF: 51.65MHz 2nd MF: 450kHz	
Working Voltage	7.5V negative grounding	
Working Temperature	-25℃~ +55℃	
Antenna Impetance	50Ω	
Mic Impedance	2kΩ	
Battery (Standard)	Model: KB-58L, Li-Ion Battery DC 8.4V , 1200mAh	
Dimension (WxHxD)	56 mm×102 mm×29 mm	
Weight	235g (With battery and antenna)	

7.2 Receiver

Available Sensitivity (12dB SINAD)	≤0.28μV
Squelch Activation Sensitivity	≤0.25uV @ level 3 squelch
Receiver Surplus Output	≤-45dB
Modulation Receiving Bandwidth	±7kHz
Adjacent Channel Selectivity	≥70dB
Intermediation Reject Ratio	≥65dB
Spurious Response Reject Ratio	≥70dB
Audio Output Power	Internal speaker: 500mW, balance @ distortion≤5%, 16Ω
Receiver Surplus Output	≤350mA
Modulation Receiving Bandwidth	≤20mA

7.3 Transmitter

RF Power	4.0W @7.5V DC
Frequency Stability	≤ ±2.5×10^{-6}
Maximum Modulation Frequency Deviation	±5kHz
Modulation Sensitivity	15mV
Modulation Distortion (300~3000Hz)	≤ 3%
Adjacent Channel RF Power	≤-70dB
Spurious and Harmonics Residential Frequency	≤ -70 dB
Modulation	≤ -45 dB
Transmitting Current Sinking	≤1.8A @ 7.5V DC

Chapter 8 Trouble Shooting

1	No display after switching on the radio.	● Battery power may be insufficient. Recharge or change the battery pack. ● The power switch is broken, and please change it. ● The CPU is broken, and please change it. ● The radio is remote killed and reprogram it.
2	PLL is unlocked. (Beep sounds)	● The PLL crystal oscillator X301 is broken, and please change it. ● The oscillatingtube is broken, and please change it. ● The PLL chip IC301 is broken, and please change it.
3	Cannot talk to or hear other group members.	● Make sure the two communication radios are using the channel of the same frequency. ● Make sure the CTCSS/DCS tone is the same as that of your group members. ● Out of the effective communication range.
4	Cannot receive signals.	● The antenna is not well connected, and please screw the antenna again until secure. ● HF amplifier Q26 is broken, and please change it. ● The squelch level is too high and the squelch cannot be activated. Reset the squelch level with a computer. ● Mixer tube Q21 is broken, and please change it. ● MF processing chip IC408 is broken, and please change it.
5	The indicator lights red when in transmitting but no voice can be heard.	● The power amplifier tube Q104 is broken and there is no power output and please change it with a new tube. ● The microphone is broken, and please change it with a new one. ● The operational amplifier IC402 is broken, and please change it with a new one.
6	The indicator lights green when in receiving but no voice can be heard.	● The speaker is broken, and please change it with a new one. ● The audio amplifier IC401 is broken and please change it with a new one. ● The switch tube Q404 and Q405 is broken, and pleas change it with a new one. ● The operational amplifier IC408 is broken, and please change it with a new one.
7	Cannot program the radio parameters normally.	● Make sure the programming cable is well connected. ● The computer RS-232 serial port output is unmoral, and please fix the computer. ● The MIC is not well connected with the SPK socket. Check the socket and if it is unable to work normally please change it with a new one.

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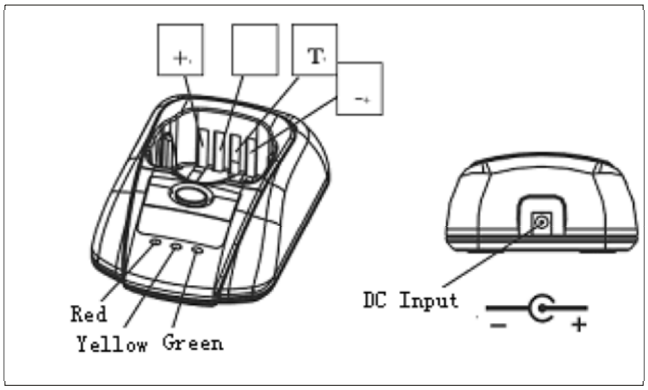
Chapter 9 KBC-42A Charger

9.1 Charger Specifications

A) Idling Input Current: ≤15mA
B) Charging Terminal Maximum Idling Voltage: 96%～97% of the Input voltage
C) Ni-MH Battery's Maximum Charging Time : 285±15 seconds
D) Lithium Battery's Maximum Charging Time: 510±30 seconds
E) Maximum Charging Voltage Limit: 9.4V±0.1V

9.2 Charging and Charging Indicator

Charger Status	LED Status		
	Charging Indicator （RED）	Power Indicator （GREEN）	Battery Temperature Abnormal Indicator (YELLOW)
Standby/ No Connection with Battery	/	Light	/
Precharge	Flash	/	/
Rapid Charge	Light	/	/
Complete Charging or in Trick Charge	/	Light (Ni-MH)	/
Output Short-circuit	/	/	/
Abnormal	/	/	Light



LED red: Charging indication
LED yellow: Power indication
LED green: Charging completion

Note:
After putting the battery pack that has been discharged completely into the charger, its red indicator needs about 1~2 minutes to turn light.

Appendix 1 Abbreviations

AMP amplify, amplifier
ANT antenna
APC automatic power control
BPF band pass filter
CTCSS continuous tone control squelch system
DCS digital code squelch
DEMOD demodulation
E^2PROM electrically erasable programmable read-only memory
HPF high pass filter
IDC instantaneous deviation control
IF intermediate frequency
LED Light-Emitting Diode
LNA low noise amplifier
LPF low pass filter
MCU micro control unit
MIC microphone
MOD modulation
MONI monitor
PLL phase lock loop
PTT push-to-talk
RX receiver
SPK speaker
TCXO temperature compensated crystal oscillators
TX transmitter
UL un-lock
VCO voltage control oscillator

Appendix 2 Framework Component List

No.	Material Serial No.	Name/Specification	Note	QTY
1	201-005200-R04	Surface shell,PC+ABS, black	2 nuts inlaid	1
2	201-000668-R02	Volume knob,PC+ABS,black		1
3	201-000668-R03	Encoder knob,PC+ABS,black		1
4	201-000668-R04	PTTcover board,PC+ABS,black		1
5	201-000668-R05	PTT plastic keystroke,PC+ABS,black		1
6	201-000558-R05	Coping,PC+ABS,black		1
7	201-000558-R14	Push fastener,PC+ABS,black		1
8	201-000558-R07	Anode shrapnel bracket,PC+ABS,black		1
9	201-000558-R08	Annunciator keystroke stake,PC+ABS,black		1
10	201-000558-R09	Light pole,PMMA,transparent		1
11	203-000558-R07	Antenna head, brass nickle plating		1
12	203-000558-R11	Antenna nut,brass,black passivation		1
13	203-000558-R02	Switch nut,brass,black passivation		2
14	203-003208-R09	Knob retaining ring,stainless steel,0.18THK	Refer to PT3208	2
15	203-003208-R02	Anode shrapnel, phosphorus copper gold plating	Refer to PT3208	1
16	203-003208-R04	Cathode shrapnel, phosphorus copper gold plating	Refer to PT3208	1
17	203-004200-R01	Alnico bracket		1
18	203-000558-R04	Speaker contact spring,carbon spring steel wire φ0.25,gilt		2
19	203-000558-R05	Push fastener spring,carbon spring steel wire φ0.35,nickle plating		1

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No.	Material Serial No.	Name/Specification	Position	Note	QTY
20	202-000558-R01	Earpiece-Mic jack panel cover black silica gel(enhanced elasticity) hardness70			1
21	202-000668-R01	PTT keystroke black silica gel(enhanced elasticity)			1
22	202-000558-R03	Annunciator keystroke orange silica gel(enhanced elasticity) hardness60			1
23	202-000558-R04	Switch water-proof gasket black silica gel hardness60			2
24	202-000558-R05	Antenna water-proof gasket black silica gel hardness60			1
25	202-000558-R06	Waterproof gasket black silica gel hardness60			1
26	202-000558-R07	Waterproof gasket black silica gel(enhanced elasticity) hardness40			1
27	202-000558-R08	Negative & positive terminal cushion black silica gel hardness40			2
28	202-000558-R09	Mic case orange silica gel hardness40			1
29	204-000558-R01	Speaker waterproof net,black waterproof cloth			1
30	204-006800-R06	Mic cushion,dustproof net black	Refer to PT6800		3
31	204-000558-R02	Waterproof spacer PORON black self-adhesice 0.8THK			1
32	204-000558-R03	Aluminium alloy sticker 1 PVC black self-adhesice 0.3THK			1
33	204-000558-R04	Potentionmeter cushion PVC transparent self-adhesive 0.35THK		Under FET	1
34	202-003208-R07	Thermally conductive insulator,thermally conductive rubber,2*6*9 blue	Refer to PT3208	Positive terminal screw	1
35	302-17040G-R01	Self-tapping screw,M1.7X4.0 flat round cross head nickle plating	Refer to PT3208	PCB,antenna head,negative terminal	1
36	301-20040G-R01	Woven belly-tooth screw,M2.0X4.0 flat round cross head, nickle plating	Refer to PT3208	screw	10
37	301-20080G-R02	Woven belly-tooth screw,M2.0X8.0 flat round cross head,nickle plating		terminal screw	2
38	301-25050J-R01	Woven belly-tooth screw,M2.5X5.0 flat round cross head,nickle plating		Alnico bracket fixing coping fixing	2

Appendix 3 Electronic Component List

No.	Material Serial No.	Name/Specification		QTY
1	101-05200U-R03	PT5200PCB / PT5200U-070110.PCB,		1
2	102-5VL45C-R01	ResetIC / R3111N451C,	IC505	1
3	102-9140NR-R01	ResetIC / PST9140NR,	U306	1
4	102-A31136-R01	IF(MF)modulationIC / TA31136FN,SSOP,IC / AK2346	IC204	1
5	102-AK2346-R01	PLL IC / MB15E03SL,PLL,16-PIN,SSOP,	IC408	1
6	102-B15E03-R01	Operational amplifier / TC75W51FU,SSOP8-P-0.65,	IC301	1
7	102-C75W51-R01	AUDIO AMP IC / TDA2822,	IC402, IC404, IC405, IC407	4
8	102-DA2822-R01	RegulatorIC / XC62FP3502PR,SOT-89,	IC401	1
9	102-FP3502-R01	RegulatorIC / TK11250CMCL,	U600	1
10	102-K11250-R01	Operational amplifier/ NJM2904V,OP-AMP,	IC503	1
11	102-M2904V-R01	MCU / CPU,M16C-M30620FCPG,	IC101	1
12	102-M30620-R01	RegulatorIC / XC6201P502PR,	IC506	1
13	102-P502PR-R01	MemoryIC / AT24C64AN-10SU2.7,	IC502, IC504	2
14	102-T24C64-R01	Chip HF switch diode / MA77,0805,	IC501	1
15	103-00MA77-R01	Chip switch diode / MA742(PANASONIC),	D102	1
16	103-0MA742-R01	Chip commute diode / 1SR154-400(ROHM),	D410	1
17	103-1SR154-R01	Chip switch diode / 0603,1SS373,	D501	1
18	103-1SS373-R01	Chip variable capacitor diode / 1SV278,	D502, D503	2
19	103-1SV278-R01	Chip HF switch diode / MA2S077,SSSMini2-F1,	D305	1
20	103-A2S077-R01	Chip switch diode / 0603,MA2S111(PANASONIC),	D101, D103, D104, D201, D100	5
21	103-A2S111-R01	Chip switch diode / DAN222,(ROHM),	D311, D504, D306	3
22	103-DAN222-R01	Chip variable capacitor diode / 0603,HVC350B(HITACHI),	D13, D202	2
23	103-HVC350-R01	Chip variable capacitor diode / HVC376B,	D206, D207, D209, D210, D700, D701	6
24	103-HVC376-R01	Chip LBD/ 0603,green,H19-213SYGC,	D302, D304, D308, D310	4
25	103-L190YG-R01	Chip LBD / 0603,red,19-21SURC/S530-A2/TR8,	D506, D509	2
26	103-MHC190-R02	Chip switch diode / RB706F-40,SOT-323,	D505, D508	2
27	103-RB706F-R01	Chip Regulator diode / MAZ806800L,	D406, D299, D720	3
28	103-Z80680-R01	Chip complex triode / UMC4,SOT-25,	ZD101, ZD401, ZD402, ZD405, ZD407, ZD403	6
29	104-00UMC4-R01	Chip triode / DTA144EE(ROHM),	Q305	1
30	104-A144EE-R01	Chip triode / DTC114EE(ROHM),	Q110, Q201	2
31	104-C114EE-R01	Chip triode / DTC144EE(ROHM),	Q108, Q109, Q506, Q507, Q105	5
32	104-C144EE-R01	Chip triode / 2SA1745(6,7),	Q405, Q501, Q505	3
33	104-SA1745-R01	Chip triode / 2SC2412K,	Q502	1
34	104-SC2412-R01	Chip triode / 2SC3356,	Q205	1
35	104-SC3356-R01	Chip triode / 2SC4116-GR,	Q102	1
36	104-SC4116-R01	Chip triode / 2SC4617(S)(ROHM),	Q401, Q720	2
37	104-SC4617-R01	Chip triode / 2SC5108Y(TOSHIBA),	Q306	1
38	104-SC5108-R01	Chip triode / KTA1298(Y),	Q101, Q111, Q204, Q301, Q304, Q308,	6

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39	104-TA1298-R01	Chip FET(field-effect transistor) / 2SJ243,	Q721	1
40	105-2SJ243-R01	Chip FET(field-effect transistor) / 2SK508NV(K52),	Q303, Q503, Q504	3
41	105-2SK508-R01	Chip FET(field-effect transistor) / 3SK318,	Q302, Q307	2
42	105-3SK318-R01	Chip FET(field-effect transistor) / RD01MUS1,	Q21, Q26	2
43	105-RD01MU-R01	Chip FET(field-effect transistor) / RD07MVS1,	Q103	1
44	105-RD07MV-R01	Chip FET(field-effect transistor) / 2SK1824,	Q104	1
45	105-SK1824-R01	Chip FET(field-effect transistor) / ST2301,	Q107, Q404, Q409, Q807, Q999	5
46	105-ST2301-R01	Knob switch / SKHLLBA010,	Q403	1
47	106-0BA010-R01	touch switch / 4.5*4.5*4.8,	K507	1
48	106-454548-R01	3208/558 Carbon encoder switch/ ED0873-16-16HC-F18(9),BAND,	K504, K506	2
49	106-ED0873-R01	Chip touch switch / SKRTLBE010,	K502	1
50	106-LBE010-R01	Chip phase frequency detector / JTBM450CX24,	K503	1
51	108-450C24-R02	Chip procelain filter / LTWC450F,450kHz±7kHz,	CD201	1
52	108-CF450F-R02	Chip porcelain filter/ LTWC450G,450kHz±5kHz,	CF201	1
53	108-CF450G-R02	Chip IF filter / DSF753SBF,51.65MHz± 4kHz/3dB,(7.0x5.0x1.3)mm,	Cf202	1
54	108-XF5165-R01	Chip resistor / 0402,0R±5%,	XF203	1
55	109-040000-R01	Chip resistor / 0402,10R±5%,	R147, R254, R315, R404, R424, R444, R453, R457, R495, R510, R519, R752, R318	13
56	109-040100-R01	Chip resistor / 0402,100R±5%,	R152, R214, R344, R349, R435, R456, R387, R800, R804	9
57	109-040101-R01	Chip resistor / 0402,1K±5%,	R805, R41, R305, R308, R434, R454	6
58	109-040102-R01	Chip resistor / 0402,10K±5%,	R42, R402, R999, R1009, R1003, R1001, R1004, C707, R545, R301, R311, R400, R417, R436, R466, R468, R522, R551, R563, R594, R506, R514, R534, R801, R346, R219	26
59	109-040103-R01	Chip resistor / 0402,100K±5%,	R395, R1111, R1002, R1005, R204, R207, R206, R208, R141, R201, R321, R252, R347, R407, R418, R426, R442, R461, R463, R467, R471, R476, R480, R487, R489, R556, R517, R350, R396, R393, R352	31
60	109-040104-R01	Chip resistor / 0402,1M±5%,	R146, R740, R234, R235, R755, R241, R242, R310, R428, R429, R430, R448, R475, R486, R493, R516, R557, R559, R432	19
61	109-040105-R01	Chip resistor / 0402,1.2K±5%,	R142, R408, R462, R474	4
62	109-040122-R01	Chip resistor / 0402,120K±5%,	R211	1
63	109-040124-R01	Chip resistor / 0402,1.5K±5%,	R339	1
64	109-040152-R01	Chip resistor / 0402,15K±5%,	R106	1
65	109-040153-R01	Chip resistor / 0402,150K±5%,	R409, R440, R498, R419	4
66	109-040154-R01	Chip resistor / 0402,180R±5%,	R302, R464, R465, R212, R803	5
67	109-040181-R01	Chip resistor / 0402,1.8K±5%,	R314, R531, R304, R704, R712	5
68	109-040182-R01	Chip resistor / 0402,18K±5%,	R416	1
69	109-040183-R01	Chip resistor / 0402,180K±1%,	R421, R422, R438, R451, R452, R482	6
70	109-040184-R01	Chip resistor / 0402,1.8M±5%,	R143, R446, R447	3
71	109-040185-R01	Chip resistor / 0402,2K±5%,	R425	1
72	109-040202-R01	Chip resistor / 0402,20K±5%,	R217, R850, R203	3
73	109-040203-R01	Chip resistor / 0402,200K±5%,	R205, R209, R388, R389, R390, R392, R455, C426	8
74	109-040204-R01	Chip resistor / 0402,22R±5%,	R218, R439	2
75	109-040220-R01	Chip resistor / 0402,220R±5%,	R104, R107, R707, R706, L701	5
76	109-040221-R01	Chip resistor / 0402,2.2K±5%,	R757, R530, R822, R823	4
77	109-040222-R01	Chip resistor / 0402,22K±5%,	R420, R144, R317	3
78	109-040223-R01	Chip resistor / 0402,220K±5%,	R431, R433, R445, R458, R478, R483, R494, R499	8
79	109-040224-R01	Chip resistor / 0402,270R±5%,	R307, R345, R521, R220	4
80	109-040271-R01	Chip resistor / 0402,27K±5%,	R121, R122, R150	3
81	109-040273-R01	Chip resistor / 0402,300R±5%,	R437, R45	2
82	109-040301-R01	Chip resistor / 0402,30K±5%,	R812, R222	2
83	109-040303-R01	Chip resistor / 0402,300K±5%,	R703, R403, R338	3
84	109-040304-R01	Chip resistor / 0402,330R±5%,	R481	1
85	109-040331-R01	Chip resistor / 0402,3.3K±5%,	R103, R108	2
86	109-040332-R01	Chip resistor / 0402,33K±5%,	R101, R118, R124, R148, R151, R216, R221, R772	8
87	109-040333-R01	Chip resistor / 0402,330K±5%,	R117, R443, R477	3
88	109-040334-R01	Chip resistor / 0402,390R±5%,	R523, R601, R709, R711	4
89	109-040391-R01	Chip resistor / 0402,39K±5%,	R123	1
90	109-040393-R01	Chip resistor / 0402,390K±5%,	R112, R116, R484, R700	4
91	109-040394-R01	Chip resistor / 0402,47R±5%,	R449, R492, R603, R351	4
92	109-040470-R01	Chip resistor / 0402,470R±5%,	R111, R115	2
93	109-040471-R01	Chip resistor / 0402,4.7K±5%,	R415	1
94	109-040472-R01	Chip resistor / 0402,47K±5%,	R1011, R1013, R213, R312, R459, R490, R520	7
95	109-040473-R01	Chip resistor / 0402,470K±5%,	R102, R113, R145, R215, R313, R322, R414, R488, R502, R515, R525, R526, R527, R528, R535, R536, R538, R539, R549, R504, R558, R561, R598, R512, R702	25

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96	109-040474-R01	Chip resistor / 0402,4.7R±5%,	R602, R708, R710	3
97	109-0404R7-R01	Chip resistor / 0402,51K±5%,	R411, R412, R309	3
98	109-040513-R01	Chip resistor / 0402,56R±5%,	R479, R701, R410, R337	4
99	109-040560-R01	Chip resistor / 0402,560R±5%,	R713	1
100	109-040561-R01	Chip resistor / 0402,5.6K±5%,	R319, R316	2
101	109-040562-R01	Chip resistor / 0402,56K±5%,	R149	1
102	109-040563-R01	Chip resistor / 0402,680R±5%,	R472, R473	2
103	109-040681-R01	Chip resistor / 0402,6.8K±5%,	R105	1
104	109-040682-R01	Chip resistor / 0402,68K±5%,	R427	1
105	109-040683-R01	Chip resistor / 0402,7.5K±5%,	R470, R811	2
106	109-040752-R01	Chip resistor / 0402,8.2K±5%,	R401	1
107	109-040822-R01	Chip resistor / 0402,82K±5%,	R599	2
108	109-040823-R01	Chip resistor / 0402,820K±5%,	R441, R450, R485	3
109	109-040824-R01	Chip resistor / 0603,0R±5%,	R756, R760	2
110	109-060000-R01	Chip resistor / 0603,150K±1%,	R110, L19, L504	3
111	109-060154-R02	Chip resistor / 0805,0R±5%,	R134, R135, R136, R137, R138, R139	6
112	109-070000-R01	Chip resistor / 1206,0.39R±5%,	R114	1
113	109-100R39-R01	Chip trimming resistor / MVR22HXBRN683,68K±	R125, R126, R127	3
114	110-110683-R01	25%,BLinear,	VR1	1
115	110-220103-R12	Chip volume switch / R08710NS-FE15C07-A103-00I,	K501	1
116	111-030000-R03	Chip self resume safety / 466003,3A,	FS01	1
117	112-043100-R01	Chip capacitor / 0402,10P±0.5P,50V,C0G,	C303, C330, C335, C359, C205, C306, C320	7
118	112-043101-R01	Chip capacitor / 0402,100P±5%,50V,C0G,	C338, C388, C225, C152, C339, C340, C341, C455	8
119	112-043102-R01	Chip capacitor / 0402,1000P±10%,50V,X7R,	C820, C231, C114, C118, C210, C238, C304, C318, C324, C331, C332, C347, C406, C409, C497, C512, C517, C538, C601, C546, C251, C329, C700, C704, C705, C706, C708, C701, C789, C784	30
120	112-043103-R01	Chip capacitor / 0402,0.01uF±10%,50V,X7R,	C348, C419, C468, C121, C147, C219, C226, C230, C246, C357, C450, C461, C465, C539, C540, C541, C542, C545, C448	19
121	112-043104-R02	Chip capacitor / 0402,0.1uF±10%,16V,X7R,	C109, C112, C122, C159, C206, C208, C213, C214, C215, C224, C227, C229, C334, C337, C345, C355, C356, C400, C404, C405, C416, C417, C432, C456, C457, C459, C463, C469, C484, C523, C490, C397, C602, C787, C709, C850	36
122	112-043105-R01	Chip capacitor / 0402,1uF±10%,50V,X7R,	C999, C221, C422, C123, C146, C403, C425, C445, C489, C491, C496, C525, C531, C532, C559, C520, C761, C806	18
123	112-043110-R01	Chip capacitor / 0402,11P±5%,50V,C0G,	C702	1
124	112-043150-R01	Chip capacitor / 0402,15P±5%,50V,C0G,	C514, C350	2
125	112-043151-R01	Chip capacitor / 0402,150P±5%,50V,C0G,	C473	1
126	112-043153-R01	Chip capacitor / 0402,0.015uF±10%,50V,X7R,	C493, C424	2
127	112-043180-R01	Chip capacitor / 0402,18P±5%,50V,C0G,	C352, C305	2
128	112-043182-R01	Chip capacitor / 0402,1800P±10%,50V,X7R,	C222, C430	2
129	112-043183-R01	Chip capacitor / 0402,0.018uF±10%,25V,X7R,	C421, C492	2
130	112-0431R0-R01	Chip capacitor / 0402,1P±0.25P,50V,C0G,	C254	1
131	112-0431R5-R01	Chip capacitor / 0402,1.5P±0.25P,50V,C0G,	C734, C733	2
132	112-043200-R01	Chip capacitor / 0402,20P±5%,50V,C0G,	C268	1
133	112-043220-R01	Chip capacitor / 0402,22P±5%,50V,C0G,	C100, C471, C472, C319	4
134	112-043221-R01	Chip capacitor / 0402,220P±5%,50V,C0G,	C411, C431, C451	3
135	112-043222-R01	Chip capacitor / 0402,2200P±10%,50V,X7R,	C447, C480	2
136	112-043223-R01	Chip capacitor / 0402,0.022uF±10%,50V,X7R,	C467	1
137	112-043224-R02	Chip capacitor / 0402,0.22uF±10%,16V,X7R,	C407	1
138	112-043270-R01	Chip capacitor / 0402,27P±5%,50V,C0G,	C515, C516	2
139	112-043273-R01	Chip capacitor / 0402,0.027uF±10%,50V,X7R,	C474	1
140	112-0432R0-R01	Chip capacitor / 0402,2P±0.25P,50V,C0G,	C349, C703	2
141	112-0432R5-R01	Chip capacitor / 0402,2.5P±0.1P,50V,C0G,	C750	1
142	112-043300-R01	Chip capacitor / 0402,30P±5%,50V,C0G,	C259	1
143	112-043330-R01	Chip capacitor / 0402,33P±5%,50V,C0G,	C228, C476, C481	3
144	112-043333-R01	Chip capacitor / 0402,0.033uF±10%,16V,X7R,	C427	1
145	112-043393-R01	Chip capacitor / 0402,0.039uF±10%,50V,X7R,	C449	1
146	112-0433R0-R01	Chip capacitor / 0402,3P±0.25P,50V,C0G,	C302, C248, C256	3
147	112-043470-R01	Chip capacitor / 0402,47P±5%,50V,C0G,	C408, C444, C402	3
148	112-043471-R01	Chip capacitor / 0402,470P±10%,50V,X7R,	C1004, C101, C104, C106, C107, C108, C113, C115, C120, C124, C132, C133, C145, C148, C149, C153, C154, C155, C156, C158, C201, C209, C212, C301, C311, C314, C315, C317, C343, C413, C423, C498, C499, C518, C521, C522, C524, C527, C528, C529, C533, C535, C537, C458, C783, C786, C351, C785, C712, C781, C236, C247, C252, C258, C260, C741, C742, C743, C744, C745, C808, C462	62
149	112-043472-R01	Chip capacitor / 0402,4700P±10%,25V,C0G,	C770, C900	2
150	112-043474-R01	Chip capacitor / 0402,0.47uF±10%,16V,X7R,	C410, C475	2

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151	112-043561-R01	Chip capacitor / 0402,560P±10%,16V,X7R,	C477	1
152	112-043562-R01	Chip capacitor / 0402,5600P±10%,16V,X7R,	C460	1
153	112-0435R0-R01	Chip capacitor / 0402,5P±0.25P,50V,C0G,	C360, C361	2
154	112-043683-R01	Chip capacitor / 0402,0.068uF±10%,16V,X7R,	C401, C446	2
155	112-0437R0-R01	Chip capacitor / 0402,7P±0.5P,50V,C0G,	C731, C105, C240, C257	4
156	112-0438R0-R01	Chip capacitor / 0402,8P±0.5P,50V,C0G,	C244, C880, C253	3
157	112-043R50-R01	Chip capacitor / 0402,0.5P±0.1P,50V,C0G,	C245, C255	2
158	112-043R75-R01	Chip capacitor / 0402,0.75P±0.1P,50V,C0G,	C730	1
159	112-063100-R01	Chip capacitor / 0603,10P±0.5P,50V,C0G,	C162	1
160	112-063101-R01	Chip capacitor / 0603,100P±5%,50V,C0G,	C131	1
161	112-063102-R01	Chip capacitor / 0603,1000P±10%,50V,X7R,	C117	1
162	112-063130-R01	Chip capacitor / 0603,13P±5%,50V,C0G,	C128	1
163	112-063150-R01	Chip capacitor / 0603,15P±5%,50V,C0G,	C129	1
164	112-0631R5-R01	Chip capacitor / 0603,1.5P±0.25P,50V,C0G,	C139	1
165	112-063240-R01	Chip capacitor / 0603,24P±5%,50V,C0G,	C126	1
166	112-0632R0-R01	Chip capacitor / 0603,2P±0.25P,50V,C0G,	C137, C308, C321	3
167	112-0632R5-R01	Chip capacitor / 0603,2.5P±0.1P,50V,C0G,	C141	1
168	112-0633R0-R01	Chip capacitor / 0603,3P±0.25P,50V,C0G,	C310, C322, C323, C309, C136	5
169	112-063430-R01	Chip capacitor / 0603,43P±5%,50V,C0G,	C161	1
170	112-063471-R01	Chip capacitor / 0603,470P±10%,50V,X7R,	C135	1
171	112-0634R0-R01	Chip capacitor / 0603,4P±0.25P,50V,C0G,	C140	1
172	112-0635R0-R01	Chip capacitor / 0603,5P±0.25P,50V,C0G,	C134, C138	2
173	112-0636R0-R01	Chip capacitor / 0603,6P±0.5P,50V,C0G,	C157, C313	2
174	112-0638R0-R01	Chip capacitor / 0603,8P±0.5P,50V,C0G,	C110	1
175	112-0639R0-R01	Chip capacitor / 0603,9P±0.5P,50V,C0G,	C130	1
176	112-063R50-R01	Chip capacitor / 0603,0.5P±0.1P,50V,C0G,	C312, C325, C307	3
177	112-072106-R01	Chip Ta capacitor/ TP Model,SIZE P,10uF±20%,6.3V,	C220, C342, C412, C418, C519, C526, C536, C470, C398, C780	10
178	112-072475-R01	Chip Ta capacitor/ TPModel,SIZE P,4.7uF±20%,10V,	C344, C150, C316, C336, C530, C452, C464, C483, C487, C760, C762, C788	12
179	112-073105-R01	Chip capacitor / 0805,1uF+80%--20%,16V,Y5V,	C354, C299	2
180	112-073225-R01	Chip capacitor / 0805,2.2uF+80%--20%,10V,Y5V,	C800	1
181	112-102105-R02	Chip Ta capacitor / TS Model,SIZE A,1uF±20%,10V,	C478, C479	2
182	112-102106-R03	Chip Ta capacitor / TS Model,SIZE A,10uF±20%,16V,	C415	1
183	112-102225-R01	Chip Ta capacitor / TS Model,SIZE A,2.2uF±20%,10V,	C327	1
184	112-102334-R01	Chip Ta capacitor/ TS Model,SIZE A,0.33uF±20%,35V	C328	1
185	112-103104-R01	Chip capacitor / 1206,0.1uF±10%,50V,X7R,	C326	1
186	112-112476-R02	Chip Ta capacitor/ TS Model,SIZE B,47uF±20%,10V,	C1112	1
187	113-010100-R01	Chip trimming capacitor / TZV2Z100A110,3~10p+100,	TC301, TC302	2
188	114-06E150-R01	Chip Wire inductor / C1608CB-15NJ,ceramic core15nH±5%,0603,	L103	1
189	114-06E180-R01	Chip Wire inductor / C1608CB-18NJ,ceramic core18NH±5%,0603,	L102, L301, L322	3
190	114-06E220-R01	Chip Wire inductor / C1608CB-22NJ,ceramic core22NH±5%,0603,	L117, L305	2
191	114-06E270-R01	Chip Wire inductor / C1608CB-27NJ,green,ceramic core27NH±5%,0603,	L304	1
192	114-06E390-R01	Chip Wire inductor / C1608CB-39NJ,ceramic core39nH±5%,0603,	L310	1
193	114-06E470-R01	Chip Wire inductor / C1608CB-47NJ,green,ceramic core47NH±5%,0603,	L306	1
194	114-06G101-R03	Chip inductor / MLG1608BR10J,100nH±5%,0603,	L302, L308, L303, L309	4
195	114-06G221-R02	Chip stacked inductor / LGHK1608R22J-T,220nH±5%,0603,	L312, L321	2
196	114-06G332-R01	Chip inductor / MLF1608A3R3K,3.3uH±5%,0603,	L313, L320	2
197	114-06G471-R01	Chip inductor / MLF1608DR47K,470nH±10%,0603,	L318	1
198	114-06G560-R01	Chip inductor / MLG1608B56NJ,56nH±5%,0603,	L702, L700	2
199	114-06G561-R01	Chip inductor / MLF1608DR56K,560nH±10%,0603,	L315, L317	2
200	114-08E221-R01	Chip inductor / FSLM2520-R22K,220nH±10%,1008,	L108	1
201	114-08E561-R01	Chip inductor / FSLM2520-R56K,560nH±10%,1008,	L704	1
202	114-08E821-R01	Chip inductor / FSLM2520-R82K,820nH±10%,1008,	L703	1
203	115-1R53R0-R04	Chip air-cored coil/ 0.4*1.5*3TL,negative,high pin,	L100, L112, L114, L116, L206, L207, L212, L720, L756, L211	10
204	115-1R54R0-R04	Chip air-cored coil/ 0.4*1.5*4TL,negative,high pin,	L732, L113	2
205	115-1R55R0-R01	Chip air-cored coil/ 0.5*1.5*5T,high pin,	L105	1
206	115-1R58R0-R02	Chip air-cored coil/ 0.4*1.5*8TL,negative,high pin,	L109	1
207	117-000000-R04	Chip bead / EMI,FILTER, SMT,BLM11A221S,0603,	L104, L106, L311, L314, L401, L307, L316, L503	8
208	117-000000-R09	Chip bead / EMI,FILTER, SMT,BLM21P600S,0805,	L110, L501	2
209	119-060222-R01	Hot quick resistor / NTH5G16P39B222J,2.2K±5%,0603,	Th301	1

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210	119-060473-R01	Hot quick resistor / NTH5G16P40B473J,47K±5%,0603,	TH101, TH22	2
211	121-200000-R01	Mic socket / B6027AP402-88(old Model:B6027AP402-65),		1
212	122-110M00-R01	Chip transistor / 10MHz,CSTCC10.0MG-TC,3*7mm,	X501	1
213	122-112M80-R02	Chip transistor/ 12.8MHz,TCXO,DSA535SA,	X301	1
214	122-23M686-R01	Plug-in crystal oscillator / 3.6864MHz,	X402	1
215	124-050000-R04	3.5mm Mic socket/ SP/MIC,ST-212,	J402	1
216	124-050000-R05	2.5mm Eearphone socket / SP/MIC,EJ-2507-CCPA,	J401	1
217	125-041022-R01	Chip net resistor / 1K*2,0402,1/16W,	CP509, CP517, CP524, CP599, CP505, CP591	6
218	125-041024-R01	Chip net resistor / 1K*4,0402,1/16W,	CP507, CP516, CP518, CP519, CP525, CP593	6
219	603-0W558A-R01	Voice recorder IC / W588A080,binding,	U407	1

Appendix 4 Accessory List

Item	Model	Specification	Accessory Figure
Battery	KB-42A	7.4V 1200mAH Li-Poly Battery	
Hand Strap	KGS-01		
Earphone	KME-005		
	KME-009		
Charger	KBC-42A	7-hour standard charger	
Antenna	KA-3U064		
	Short Antenna		

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Figure 1 PT5200 Top Board Position Mark Diagram

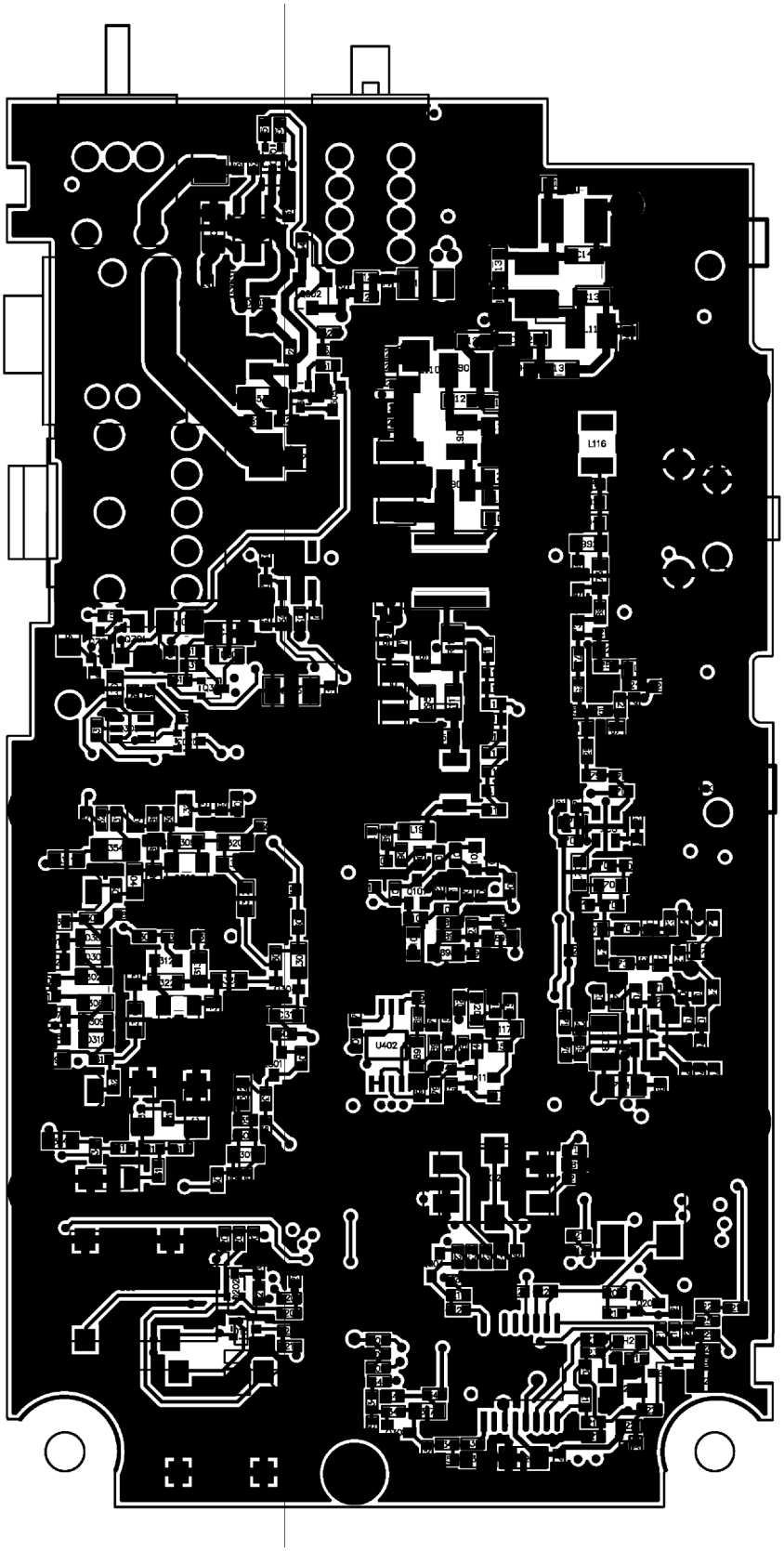

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Figure 2 PT5200 Bottom Board Position Mark Diagram

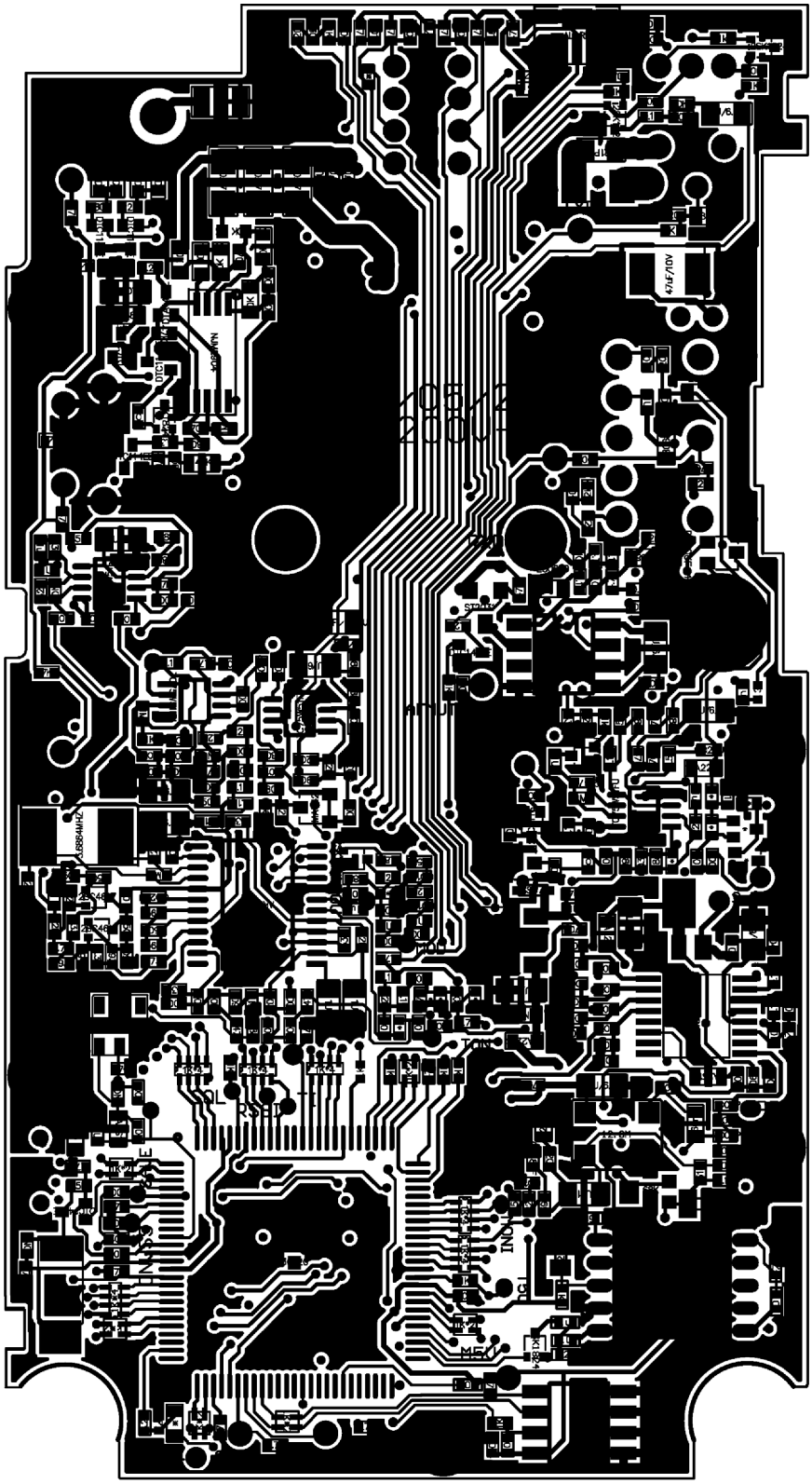

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Figure3 PT5200 Schematic Circuit Pane Diagram

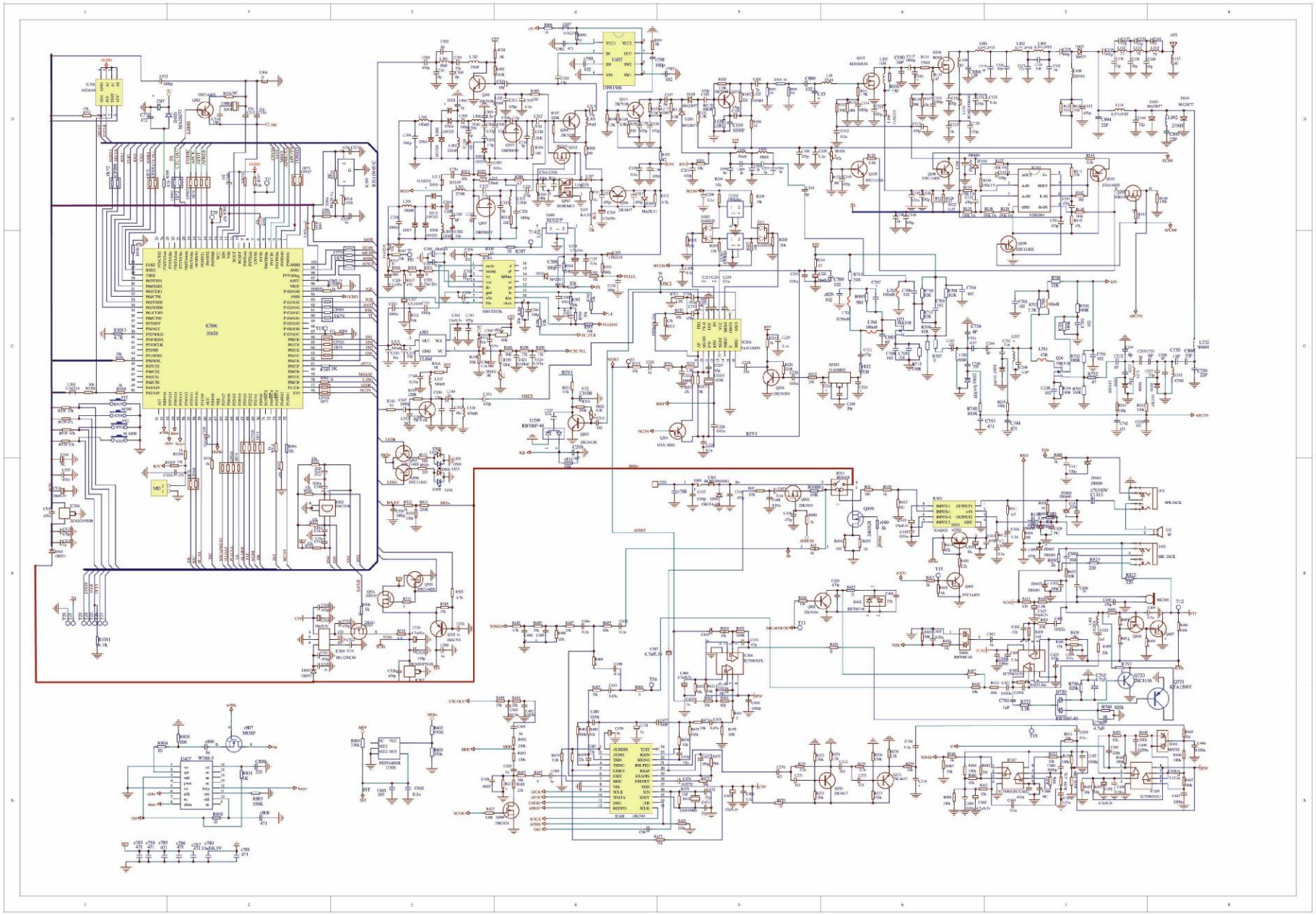

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Figure4 PT5200 Schematic Circuit Pane Diagram

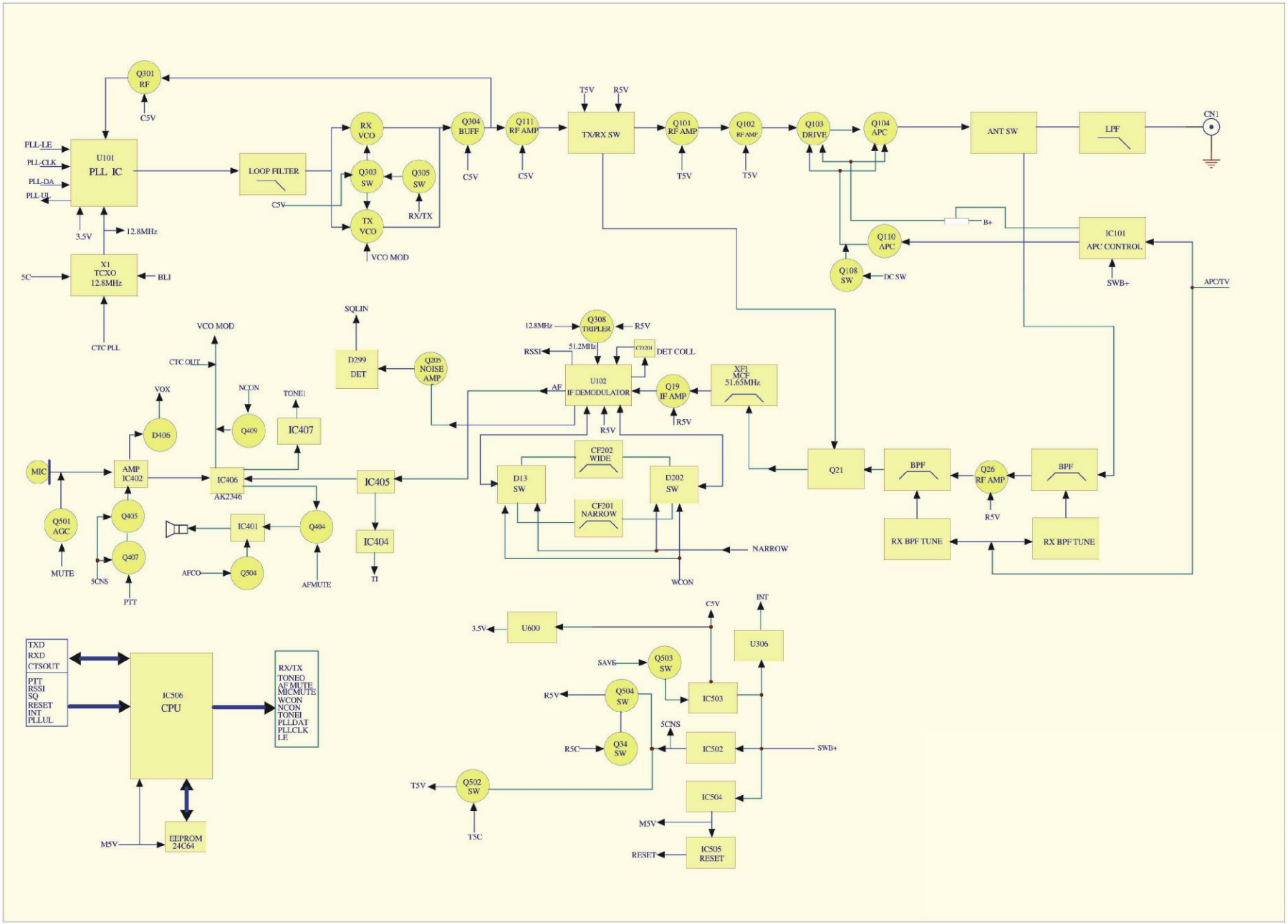

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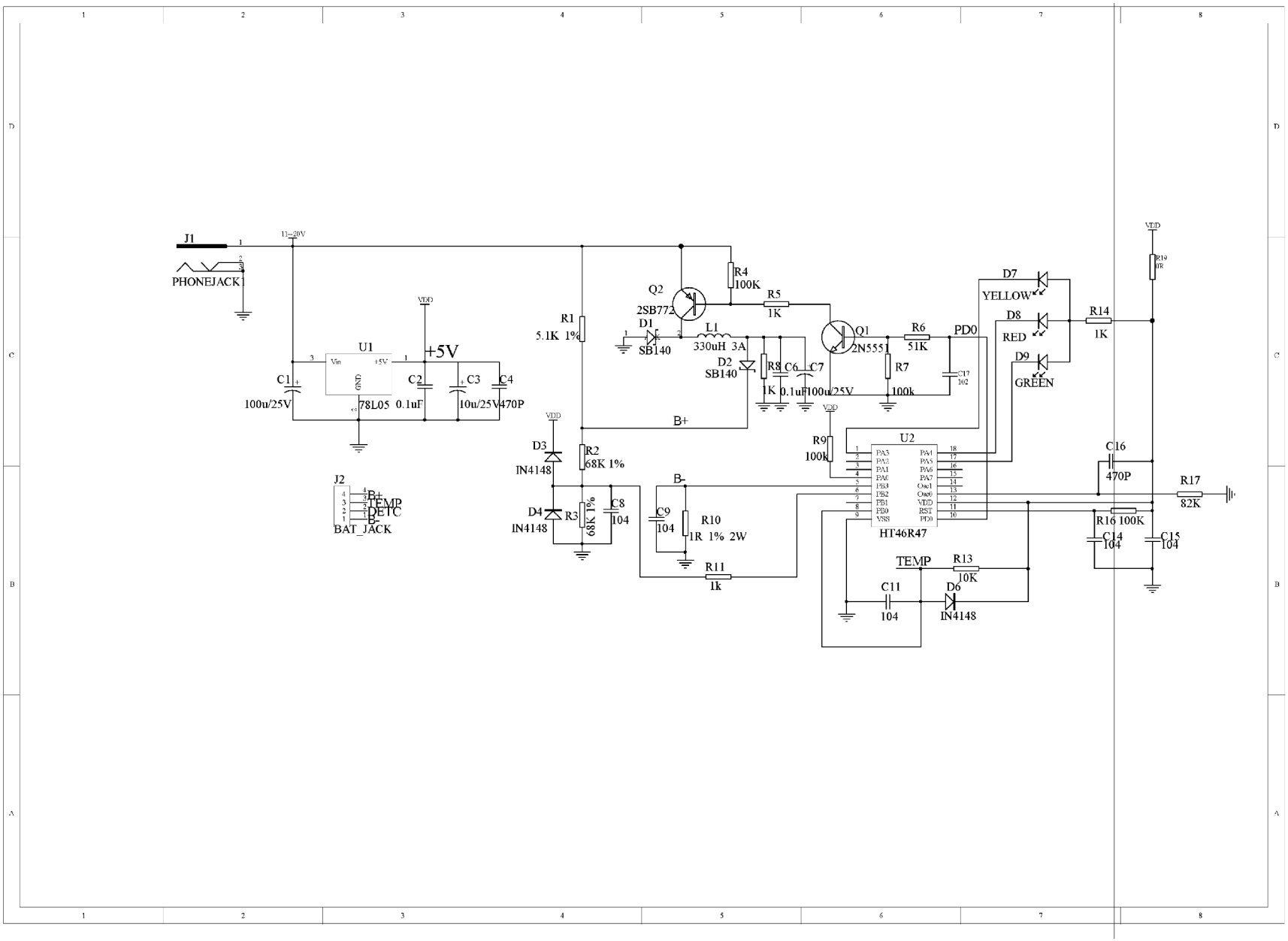
Figure 5 KBC-42A Schematic Circuit Diagram



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